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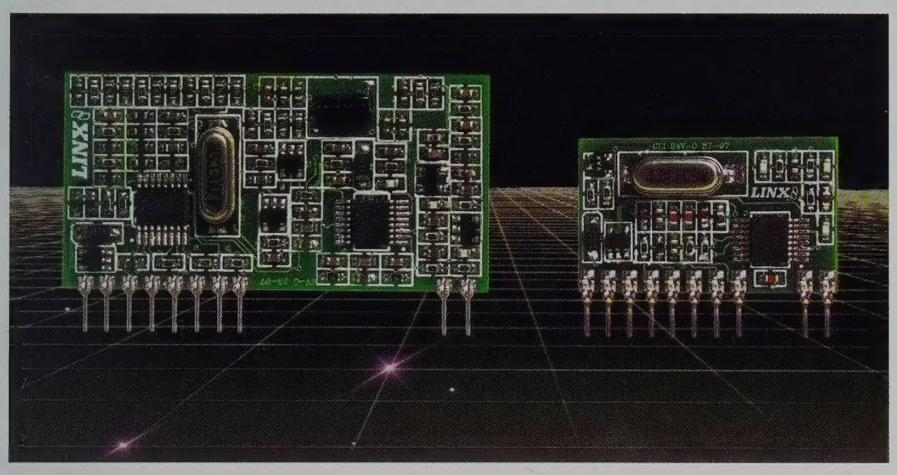
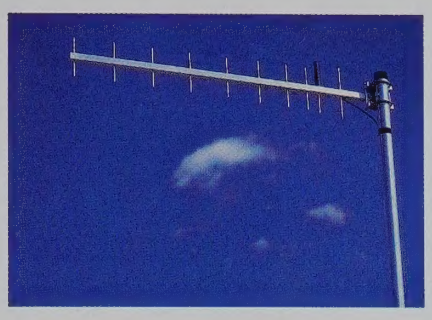


Wireless Data Modules Set New Standards for RF Integration

Designed for cost-effective, high-performance wireless transfer of serial data, the new HP series features eight binary selectable channels in the 902-928 MHz band. An advanced synthesized architecture with microprocessor-controlled baseband processing assures optimum performance under all conditions. The HP series features low power consumption, and an outstanding 50 kbps maximum data rate. An open Serial-In Serial-Out (SISO) interface allows the HP to easily interface with any microcontroller, encoder/decoder, or UART. CTS, RSSI, and power-down functions are all present, an unheard of accomplishment in the HP series class.

Linx Technologies, Inc., 1089 Medford Center, Medford, OR 97504.

More Information - Write In 101



Yagi Design Combines Quality and Performance

The PC9010N is one of a series of directional yagi antennas which operate in frequencies ranging from 806-980 MHz. The series offers antennas of 6, 8.5, 11, 12 and 13 dBd gain in these frequencies. Designed for spread spectrum applications, the antenna provides a minimum of 12 dBd gain with a nominal 40 by 45 degree half power beamwidth. The antenna construction is designed to be completely weatherproof. Complete weatherability is achieved by enclosing the feed system in a potted PVC radome that will stand up to the most demanding weather elements. There are no moveable components, therefore adjustments are never needed.

Cushcraft Corporation, 48 Perimeter Road, Manchester, NH 03103.

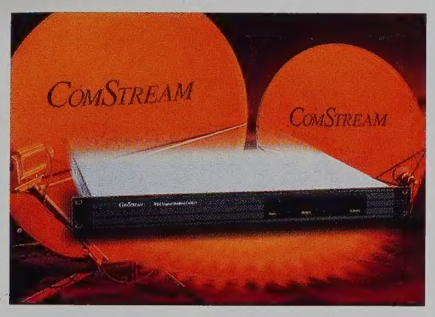
More Information - Write In 104

Repeaters Solve Coverage Problems

The Allgon TDMA adjustable band selective and CDMA channel selective repeaters have received FCC approval and are available for the different systems at 1900 MHz. The repeater has a unique design and features a sleek weatherproof exterior case that acts as the cooling system. Already proven to have outstanding performance capabilities, the repeater can be easily upgraded for use with fiber by a very flexible module system. All parameters can be controlled locally or remote in real time.

Allgon Enterprises, Inc., 7317 Jack Newell Blvd. North, Forth Worth, TX 76118.

More Information - Write In 102

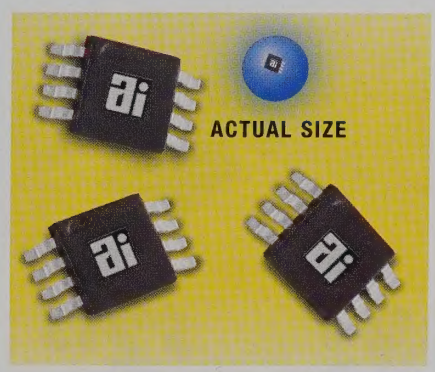


Compact Digital Satellite Modem

Based on ComStream's CM701 modular modem technology, the CM601 is a new compact, digital satellite modem for two-way telephony, data, and broadcast applications. The CM601 is a complete 4.8 to 512 kbps modem contained in a one rack, unit-high chassis. The modem card contains a modulator, a demodulator, Doppler buffer, and an RS-449/422 or V.35 interface port. The modem supports variable rates in 1 bps steps and is particularly well suited for single channel per carrier (SCPC) star networks requiring multiple modems at the hub, and SCPC demand-assigned (DAMA) networks requiring fast acquisition and low cost. The modem is available with Viterbi or sequential FEC.

ComStream Corporation, 10180 Barnes Canyon Road, San Diego, CA 92121.

More Information - Write In 103



GaAs IC Transfer Switch in MSOP8 Package

Alpha Industries' AS127-59 is a 4 port switch designed to combine T/R and antenna changeover switching capability in one device. By eliminating the duplexer, this switch reduces the size weight and cost, without sacrificing performance. Available in an MSOP8 package, the AS127-59 features high linearity, thereby reducing rejection requirements of filters. The IC transfer switch delivers low insertion loss which translates into longer talk time and less power requirements. This switch offers excellent performance up to 2 GHz making it suitable for dual band applications.

Alpha Industries, 20 Sylvan Road, Woburn, MA 01801.

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IN THIS ISSUE:

Antenna Selection for Sectored Cell Sites
Rick Good and John Kadingo of the Decibel Products Division of Allen Telecom Inc. review the characteristics that must be considered when deciding which antenna to use.

ATM Via Satellite
An overview of the key benefits and diverse applications of ATM via satellite technology is presented in detail by Susan Miller of COMSAT Corporation.

ALSO:

Company Web Site Review

Designer's Corner: Capacitors

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F 194 Rev A

Asia's Economic Woes

Nancy Maas, Editor-in-Chief

According to the "U.S. Industry & Trade Outlook 1998" the U.S. wireless industry growth projections "are expected to be as good or even better" than in the past. The outlook went on to state "the global wireless market is poised for tremendous growth over the next five years and beyond." Asia was noted in the report as being the fastest-growing region overall.

I guess this means that domestic manufacturers can expect to have a very prosperous year in 1998 and that the economic instability occurring in Asia right now will have very little, if any, impact on U.S. companies and their economic future. I don't think so. Asia's powerful force has been a major factor fueling global prosperity. Although we are not directly involved, the economic turmoil in Southeast Asia threatens to destabilize financial markets around the world.

In essence, the loan requires South Korea to make some major economic structural changes in the way they do business.

On December 3 the International Monetary Fund (IMF) signed a $57 billion loan for the purpose of saving the financial system of South Korea. Conditions of the loan could have wireless companies worldwide feeling the squeeze along with the economy of South Korea. Agreement terms between South Korea and the IMF call for a significantly lower, but perhaps more realistic, projected growth rate in 1998. In essence, the loan requires South Korea to make some major economic structural changes in the way they do business. Changes we can expect to see in the future include a reduction in government spending and a stricter monetary policy overall. Implementing such changes will most likely result in a significant slowdown in their economy. The significance of this change and the way it will impact the U.S. markets is somewhat indirect but very real. When the South Korean government tightens their belt in order to meet the loan requirements, government spending will be drastically reduced and investment in projects such as expanding the country's telecommunication infrastructure will be cut back. As a result, the demands for our goods and services will decline. We sell less, we earn less. Lower earnings from Asian markets will result in lower profit margins and less capital available for investment purposes at home and abroad.

Without a doubt, Asia's financial woes will hit home. Granted the effects will not be great but they will be there. Asia offers immense wireless telecommunications trade opportunities for U.S. firms. The U.S. sells about a third of our exports to Asia so this situation must be taken seriously. If we are going to participate in global commerce, we must keep a watchful eye on the economic conditions of markets worldwide and be willing to get involved in order to bring stability back to a threatened economy.

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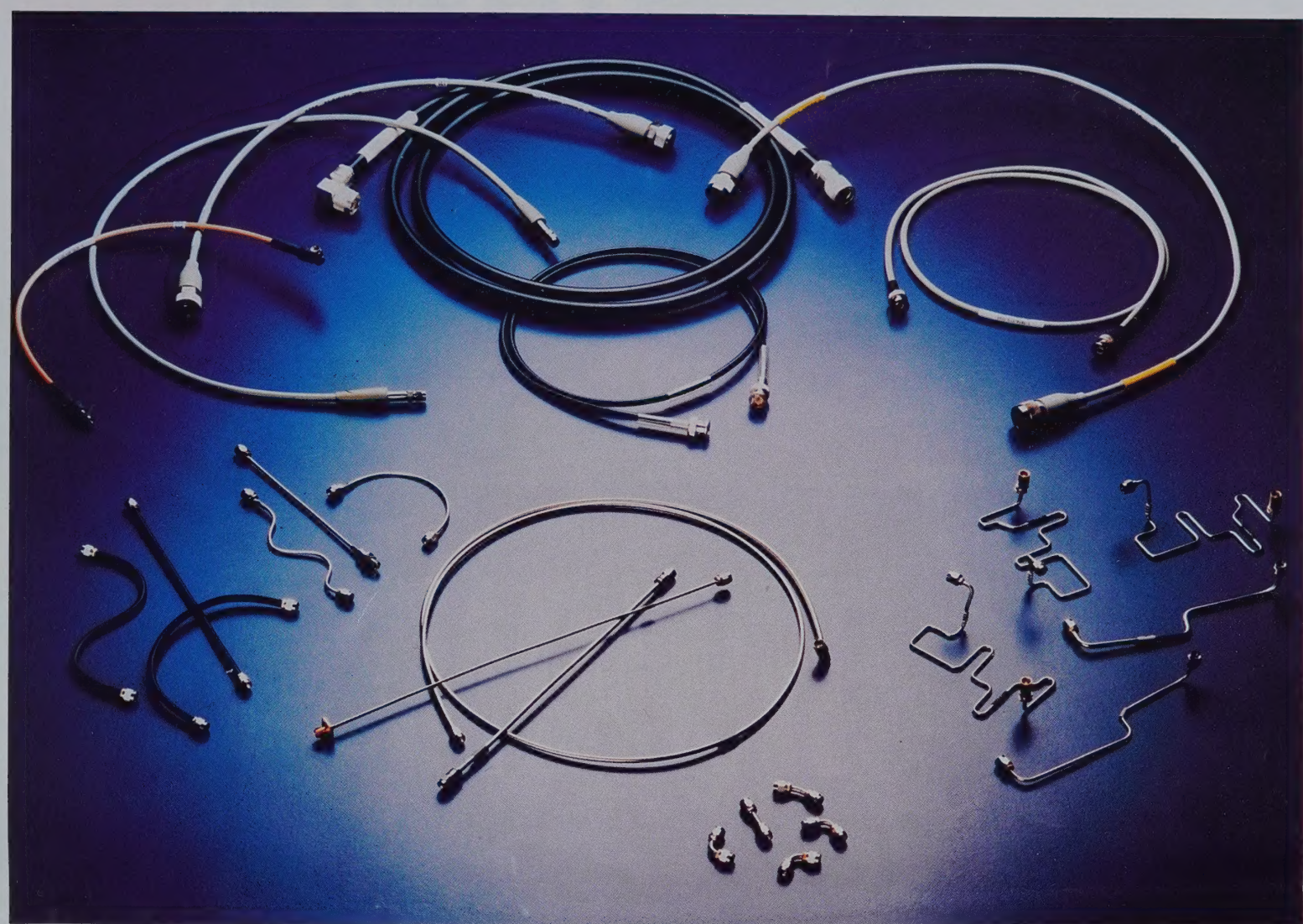

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Solid-State Microwave Amplifier

Amplifier Research (AR) introduces the 50S1G4, an all-solid-state microwave amplifier offering 50 watts minimum CW power across a frequency range of 0.8 to 4.2 GHz. The 50S1G4 withstands worst-case VSWR scenarios and will operate uninterrupted throughout its bandwidth without shutdown, bandswitching or tuning. It is rated over two-octaves, offering twice the output of competitive amplifiers. Output is usually flat.

Amplifier Research

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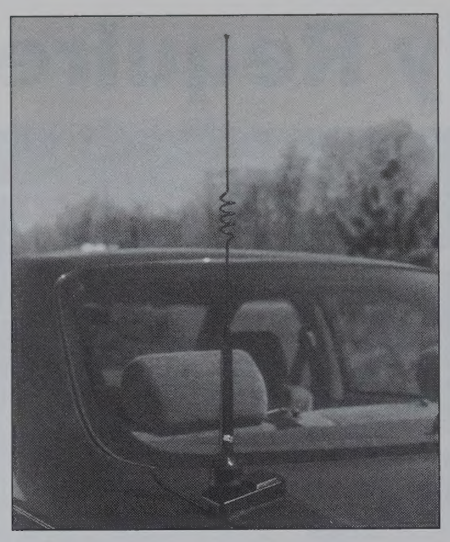

Dual-System Antenna

The Antenna Specialists Division of Allen Telecom introduces a mobile antenna that combines both GPS and cellular frequencies in a single antenna to provide users with two-way communication capabilities. By combining integrated voice and data cellular service along with GPS location capabilities, this technology allows users to install just one antenna to meet both needs. A patented Omni-Loc™ swivel allows for up to 25° vertical angle adjustment to meet the needs of sloping car trunks. An ultrasonic seal protects against extreme rain and ice conditions. Model ASPSD917TGPS operates at 824-894 MHz for cellular and 1575.42 MHz for GPS use.

Antenna Specialists, a div. of Allen Telecom Inc.

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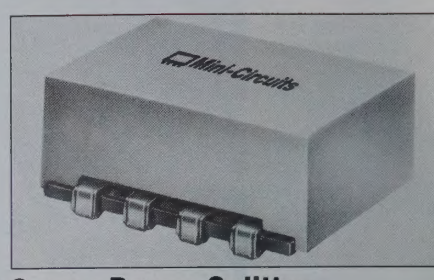

2-way Power Splitter

The JYPS-2-4-75 from Mini-Circuits will split an RF signal 2 ways, 0 degrees in the 5 to 1000 MHz frequency range. In 75 ohm environments, this device provides excellent isolation, insertion loss and VSWR of 25 dB, 0.7 dB, and 1.1:1 (typ.) respectively while delivering maximum 0.3 dB amplitude and 4 degrees phase unbalance midband. Maximum power input is 0.5 W with 0.125 W (max.) internal dissipation. Tape with up to 500 units can be supplied on one 13 inch reel. This item is equipped with solder plated J leads.

Mini-Circuits

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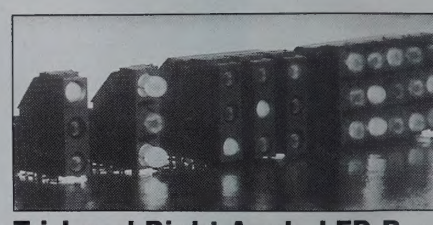

Tri-Level Right Angle LED Bar

LEDCO Division of Wilbrecht Electronics announces the TRA Series TriLevel Right Angle LED Bar. The product, which can be customized to specifications without tooling charges, features variable c/c spacing of LEDs on the bar (min. 0.170″, max. bar length 6″) and variable color sequences. Colors can be mixed within a single housing. The TRA Series is available as a single TriLevel housing or with multiple housings on a bar and can be constructed with 2 to 35 TriLevel T LEDs in one convenient assembly. Wave solderable, chemically cleanable, and available with optional light shields which eliminate light bleed, the TriLevel design conserves board space.

Wilbrecht Electronics, Inc.

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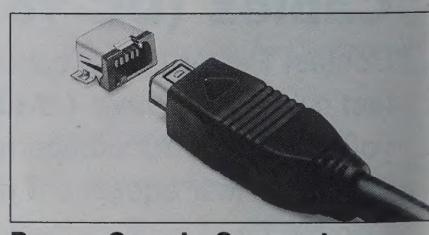

Power Supply Connectors

Hirose has introduced the MQ172 series of compact power supply connectors that also doubles as an I/O connector for small hand-held devices. Applications for the 3-position MQ172 series include handheld devices such as cellular phones, hand-held computers and PDAs. The lightweight MQ172 is not only space-saving, it also uses a stable two-point mating contact and a snap latch with a positive "click" connection. Durability is assured through 5,000 insertions. S-shaped spring contacts prevent stressing of solder joints. The contacts have 3 amp capacity and accommodate 24-32 AWG wiring and a choice of three keyings.

Hirose Electric (U.S.A), Inc.

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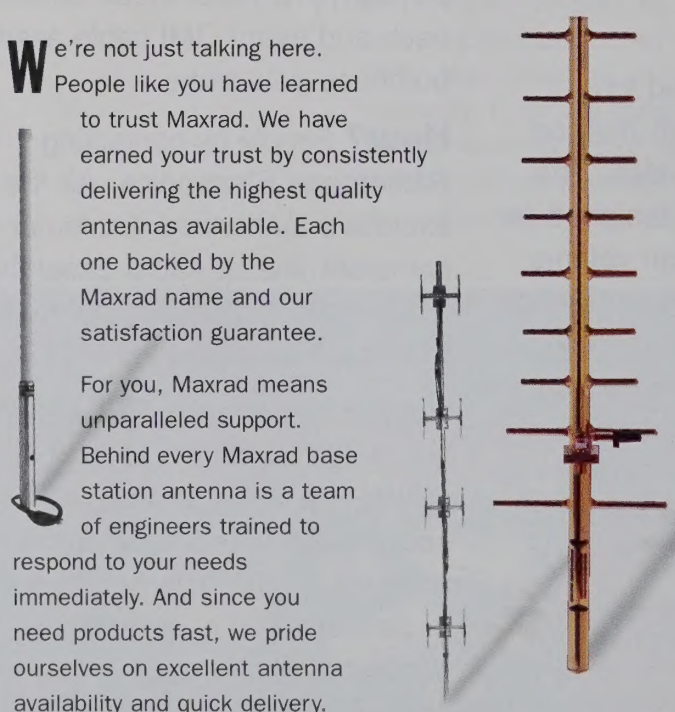

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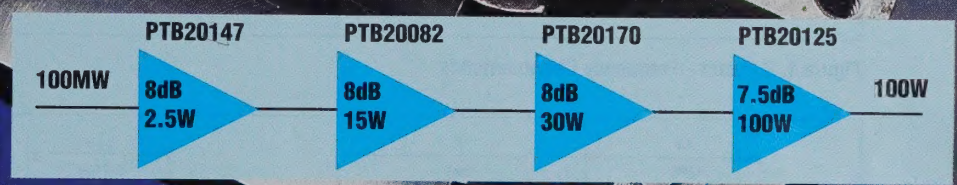

Part Number	Frequency MHz	Pout Watts	Gain db	Vcc Volts
1800-2200 MHz PCS/PDC				
PTB20146	1800-1900	0.4	8.0	26
PTB20179	1800-2000	0.4	8.0	26
PTB20209	1800-2000	0.4	8.0	in dev
PTB20147	1800-1900	2.5	8.0	26
PTB20180	1800-1900	2.5	8.0	25
PTB20187	1800-2000	4.0	8.0	26
PTB20176	1800-1900	5.0	11.0	26
PTB20216	1800-2000	6.0	8.0	26
PTB20082	1800-1900	15.0	8.0	26
PTB20191	1800-1900	12.0	8.0	26
PTB20071	1800-1900	21.0	8.0	26
PTB20170	1800-2000	30.0	8.0	26
PTB20230	1800-2000	45.0	9.5	26
PTB20151	1800-2000	45.0	7.0	26
PTB20175	1900-2000	55.0	7.0	26
PTB20193	1800-1900	60.0	7.0	26
PTB20125	1800-2000	100.0	7.5	26
PTB20232	2100-2200	4.0	8.5	24
PTB20231	2100-2200	18.0	8.5	26
PTB20235	2100-2200	70.0	8.0	26

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More Information - Write in 403

Pre-Set UHF Trimmer Capacitor

By Mike Albert,
North American
Capacitor Company

The introduction of Surface Mount Technology into the manufacturing of electronic systems has led to design approaches involving the substitution of mechanically tuned variable capacitors by single or arrayed fixed capacitors.

Surface Mounted Miniature Ceramic Trimmer Capacitors are, in general, components with low working voltage utilizing dielectric materials of relatively high permitivity and non-zero temperature coefficient of capacitance.

For applications in filter networks, antenna tuning, impedance matching, telemetry, tuning in a manufacturing environment may be obtained with precision and efficiency through the use of pre-set trimmer capacitors.

In response to a customer's request for components in a specific area of application, a special model of air dielectric tubular trimmer capacitor was developed meeting the following requirements:

- Surface Mount Trimmer Capacitor that can be mounted on a small board.
- Tuning capacitance range of 0.5 to 3.5 - 4 pFd
- 250 V working voltage
- High "Q" - factor over the frequency range of 100 through 1000 MHz
- Pre-set capacitance in the mid-tuning range which will reduce the additional labor cost in the final tuning stage.

To meet the above requirements a special design of leads was developed for a standard tubular air dielectric trimmer capacitor with dimensions to conform to the footprint specified by the customer.

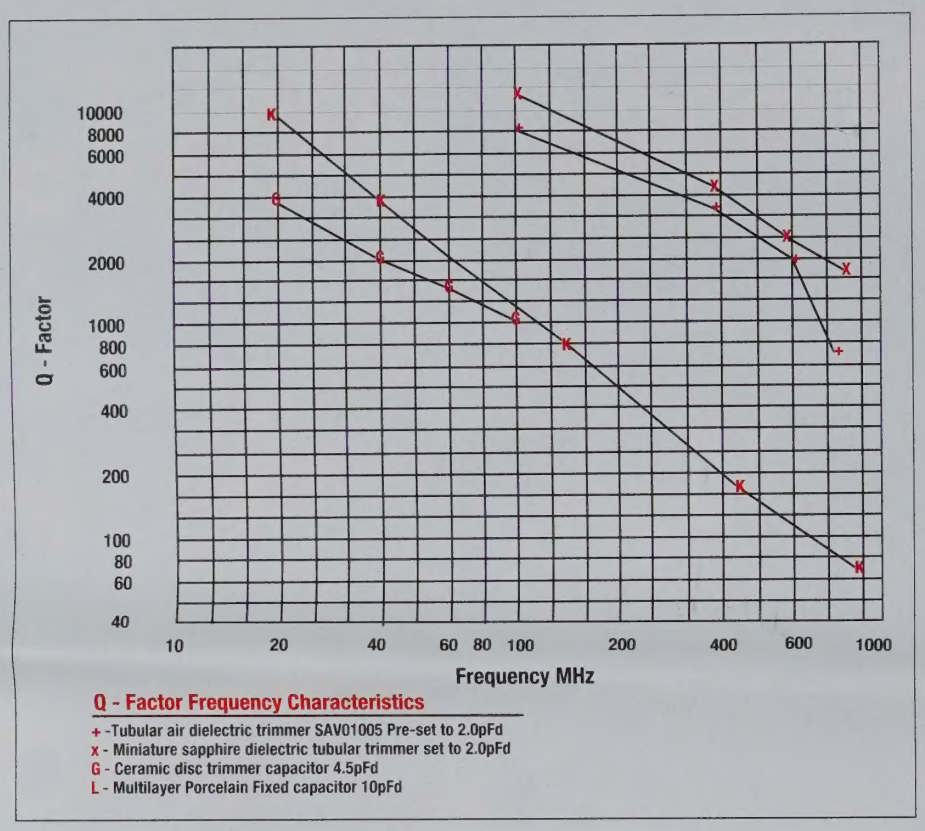

Figure 1. Q Factor - Frequency Characteristics

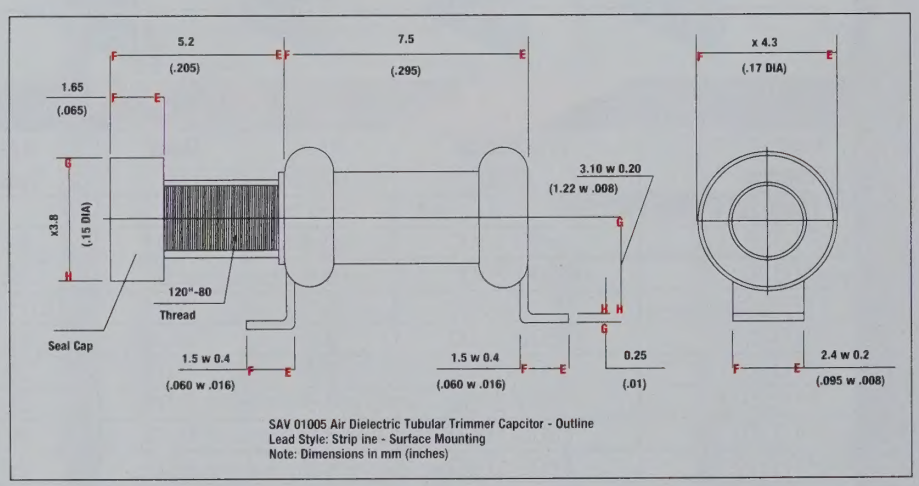

Figure 2. SAV1005 Air Dielectric Tubular Trimmer Capacitor - Outline

Design Aspects

The following two basic structures are represented in the design of miniature trimmer capacitors:

Disc-Trimmer

A metallized dielectric rotor disc is in pressure contact with the surface of a metallized ceramic or plastic stator. The structure is used in ceramic trimmer capacitors where the metallization provides a semi-circular shaped electrode. The overlapping electrode area, which yields the geometrical aspect of the capacitance, is that of a sector: r/180°,where r is the radius of the semi-circular electrode and 0 is the angle of rotation of the rotor in degrees of arc. In an alternative design configuration a metallic rotor is suspended between two metallized dielectric discs under spring pressure.

Coaxial Tubular Trimmers

Air dielectric trimmers are manufactured with coaxial tubular electrodes attached to the stator and/or to the rotor, and are aligned along the guide elements of the stator and/or the rotor. Capacitance is established across the overlapping areas of electrodes attached to the stator and rotor respectively and bounding layers of dielectric with thickness of the order of 0.010 in. Tuning of the capacitor is through an axial displacement of the tubular electrodes with respect to one another.

Capacitance per unit length of axial displacement is given as:
$C = 0.2416\ K_r / [\log (r_2/r_1)]$ pF/cm where K_r is the relative permitivity of the dielectric (K_r=1 for Air), r_2 and r_1 are the radii of the two electrodes with $r_2 > r_1$.

Coaxial tubular trimmer capacitors with ceramic of sapphire dielectrics are manufactured with the stator electrode provided by the metallization of the outside of the dielectric tube and the rotor provided by a metal piston moving inside the dielectric tube.

Selection and Characteristics

Inputs of characteristics relevant to the establishment of the design of capacitors meeting customer's requirements are summarized in Table 1. Data is presented for commercially available ceramic trimmer, tubular sapphire trimmer capacitor, and for the tubular are air dielectric pre-set trimmer capacitor developed by Microelectronics.

Characteristics of "Q"-Factor-Frequency of the above three types of trimmer capacitors are shown in the diagram of Figure 1, together with the data of 10 pFd multilayer porcelain fixed capacitor. Dimensions of the capacitor are: Length = Width: 0.110 in., Thickness: 0.100 in., temperature coefficient of capacitance: 0+/-30 ppm/°C.

While ceramic dielectric materials show excellent high "Q" characteristics at UHF frequencies, the disc-trimmer structure is unsuitable for the design of precision pre-set trimmer capacitors due to the very low resolution offered by their tuning with a single turn movement. The relatively high temperature coefficient of capacitance would necessitate frequent changes of their pre-set value of capacitance during the tuning of a system which may become problematic with a not too robust mechanical tuning capability of these types of capacitors. Operating temperature range of un-encapsulated disc trimmers is -20° C to + 85° C and their resistance to cleaning solvents used in the processing of circuits may cause problems.

Miniature sapphire dielectric tubular trimmer capacitors offer superior electrical characteristics in the UHF frequency range. With appropriate lead design they can be adopted to surface mount application and the use of a seal cap will prevent penetration of cleaning solvents. Resolution of their tuning capacitance is limited by the relatively small number of turns between minimum to maximum tuning capacitance.

An outline of the air dielectric tubular capacitor developed for manufacturing a pre-set format is shown in Figure 2. Ten turns between minimum to maximum capacitances provide adequate resolution for accurate tuning. The capacitors are encapsulated in an alumina tube metallized along bands on both ends. Stator and rotor electrode sub-assemblies are attached to the metallization bands of the encapsulation by a high temperature (301° C liquidus temp.) solder. Penetration of cleaning solvent is prevented by the use of a seal cap.

Mike Albert is chief scientist for Microelectronics Ltd., located in Israel.

More Information - Write In 302

Table 1. UHF Miniature Trimmer Capacitor Data

STRUCTURE	TYPE	ELECTRICAL							MECHANICAL		
		Capacitance (pF)				Voltage (V)					
		Tuning Range	Present Value	No. Of Turns	Temperature Coefficience PPM/E	Working	Test	Q-Factor @ 100	Tuning Torque (oz-in)	Dimensions Inch (mm)	Encapsulation
DISC	Ceramic Trimmer Capacitor	1.0 - 4.5	Not Available In Preset Format	1	50 w5	250 -20° to +85°C	500	500	0.2 to 2.0	Length = Width = .300 (7.62) Thickness: .060 (1.52)	None
COAXIAL TUBULAR	Miniature Sapphire Dielectric Tubular Trimmers	0.6 to 4.5	Not Available In Preset Format	5	0 w50	500 -55°C to +125°C	1,000	5,000 @ 250 MHz	0.2 to 2.0	Length: .315 (8.0) Diameter: .118 (3.01)	None
COAXIAL TUBULAR	SAVO 1005 Air Dielectric Pre-set Trimmer	0.4 to 3.5	2.0	10	0 w15	250 -55° to +125°C	500	5,000	0.3 to 3.0	Length: 5 in. (12.7) Diameter: .15 (3.8) See Fig.1 Outline Drawing	Alumina tubes metallized along bands on both ends. See: Fig.1 Outline Drawing

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ADE* TYPICAL SPECIFICATIONS

Model	mm	Freq. (MHz)	LO (dBm)	Conv. Loss Midband (dB)	L-R Isol. Bandwide (dB)	IP3 (dBm) Midband	Price ($ea.) Qty. 10-49
ADE-12	2	50-1000	+7	7.0	35	17	2.95
ADE-13	2	50-1600	+7	8.1	40	11	3.10
ADE-18W	3	1750-3500	+7	5.4	33	11	3.95
ADE-901	3	800-1000	+7	5.9	32	13	2.95
ADE-14	2	800-1000	+7	7.4	32	17	3.25
ADE-20	3	1500-2000	+7	5.4	31	14	4.95
ADE-20H	3	1500-2000	+17	5.2	29	24	8.95
ADE-18	3	1700-2500	+7	4.9	27	10	3.45

***Patent Pending.**
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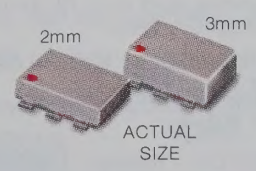

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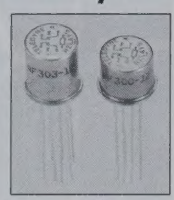
Teledyne Relays Introduces the RF300 and RF303 High Repeatability TO-5 Relays



HAWTHORNE, CA — The RF300 and RF303 (sensitive coil version) are the newest additions to Teledyne Relays' growing RF-based switching technology relay product line.

The RF300 and RF303 provide improved RF signal repeatability to ± 0.1 dB or better, over the frequency range up to 3 GHz. Enhanced RF performance has been designed-in by balancing the aggregate insertion loss elements of the relays' design.

Highly suitable for use in attenuator and other RF circuits, the RF300 and RF303 feature excellent RF signal repeatability over a broader bandwidth than earlier model TO-5 relays, metal enclosure for EMI shielding, ground pin option to improve case grounding, high isolation between control and RF signal paths and high resistance to ESD.

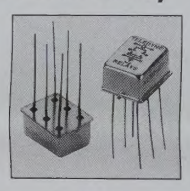
These ultraminiature RF relays are housed in Teledyne Relays' TO-5 relay package measuring only 0.370" (9.40 mm) diameter x 0.275" (6.99 mm) high for the RF300 and 0.385" (9.78 mm) high for the sensitive RF303. The internal welded construction and Uniframe design offers high motor magnetic efficiency and exceptional mechanical ruggedness. Contacts are gold plated precious metal alloy for low contact circuit losses and reliable switching.

Coil volatages available are 5 and 12 volts DC. The RF300 is priced at $29.70 each, the sensitive RF303 is priced at $31.20 each, at 100 pcs and are available from stock to 8 weeks ARO.

For additional information or a data sheet on the RF300 and RF303 high repeatability TO-5 RF relays, contact Teledyne Relays.

More Information - Write in 406

A Fully Integrated Attenuator Relay



HAWTHORNE, CA — Teledyne Relays has introduced a new series of ultraminiature electromechanical relays which are designed to be self contained, single section, switchable attenuators.

The Al50 Attenuator Relays are the only hermetically sealed ultraminiature electromechanical relays in the marketplace today which can attenuate RF signals without the need for additional external components. These revolutionary new devices have been engineered for use in 50 ohm systems over the frequency range from dc to 3 GHz; are no more than .050 cubic inches in volume, occupy less than 0.200 square inches of board space and weigh less than 0.12 ounces.

TO-5 and Centigrid® relay technology have been combined with thin-film and microwave technology to yield a unique switchable attenuator design which features precision attenuation, low insertion loss, low VSWR over the frequency range, high isolation between control and signal paths, stable attenuation vs temperature, good phase linearity vs frequency and excellent intermodulation performance. The thin-film matched attenuator pad is integrated into the mechanical switching circuit in each unit.

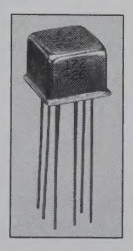
The attenuator relays are housed in Teledyne Relays' extended Centigrid® hermetically sealed 0.280" x 0.375" x 0.475" package with 0.150" x 0.200" grid lead pattern. They also feature internal welded construction and uni-frame design for high motor magnetic efficiency and exceptional mechanical ruggedness; gold plated precious metal contacts for low contact circuit losses and reliable switching.

Units are available in binary steps of 1, 2, 3, 4, 5, 6, 10, 16, and 20dB that can be cascaded to form multi-section attenuators. Available coil voltages are 5, 12, 15 and 26.5 Vdc.

For information about the A 150 Attenuator Relay, contact Teledyne Relays.

More Information - Write in 407

The 172 General Purpose Centigrid® Relays



HAWTHORNE, CA — Teledyne Relays has introduced a family of Commercial Centigrid® relays designed specifically for general purpose usage. The 172 series Ultraminiature Centigrid® relays are rated from low level to 1 amp, 28 volts DC. This unique contact system also makes the 172 an excellent choice for switching frequencies well into the UHF spectrum.

By virtue of its inherently low intercontact capacitance and contact circuit losses, the 172 is highly suitable for use in attenuator and other RF circuits. The 172 features excellent RF signal performance over a broad bandwidth, metal enclosure for EMI shielding, ground pin option to improve case grounding, high isolation between control and signal paths and high resistance to ESD.

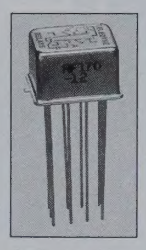
The 172 offers a variety of options such as a surface mount configuration as well as an internal diode for coil transient suppression. Unique construction features and manufacturing techniques provide overall high reliability and excellent resistance to environmental extremes.

These ultraminiature General Purpose relays are housed in Teledyne Relays' Centigrid® package measuring only 0.375" (9.53 mm) square and 0.280" (7.11 mm) high. The internal welded construction and Uniframe design offers high motor magnetic efficiency and exceptional mechanical ruggedness. Contacts are gold plated precious metal alloy for low contact circuit losses and reliable switching. Coil voltages available are 5, 12 and 26.5 volts DC. The 172 is priced at $13.78 each, at 100 pcs and are available from stock to 12 weeks ARO.

For additional information or a data sheet on the 172 General Purpose Centigrid® relays, contact Teledyne Relays.

More Information - Write in 408

RF170 Magnetic Latching Centigrid® RF Relays



HAWTHORNE, CA — Teledyne Relays has introduced a series of Centigrid® relays with enhanced RF performance. The RF170 Magnetic Latching relays is one of the newest additions to Teledyne Relays' growing RF-based switching technology relay product line.

The RF170 provides improved RF signal isolation of 30dB or better, over the frequency range up to 4 GHz. Enhanced RF performance has been designed-in by incorporating a contact geometry that enhances the relays' RF isolation properties.

Highly suitable for use in attenuator and other RF circuits, the RF170 features excellent RF signal repeatability over a broader bandwidth than earlier model electromechanical relays, a metal enclosure for EMI shielding, ground pin options to improve case grounding, high isolation between control and RF signal paths and high resistance to ESD.

These ultraminiature RF relays are housed in Teledyne Relays' rectangular Centigrid® package measuring only 0.375" (9.40 mm) wide x 0.475" (12.06 mm) long x 0.300" (7.62 mm) high. The internal welded construction and Uniframe design offers high motor magnetic efficiency and exceptional mechanical ruggedness. Contacts are gold plated precious metal alloy for low contact circuit losses and reliable switching.

Coil voltages available are 5, 6, 9, 12, 18 and 26.5 volts DC. The RF170 is priced at $38.85 each, at 100 pcs and are available from stock to 12 weeks ARO.

For additional information or a data sheet on the RF170 Centigrid®, Magnetic Latching, RF relays, contact Teledyne Relays.

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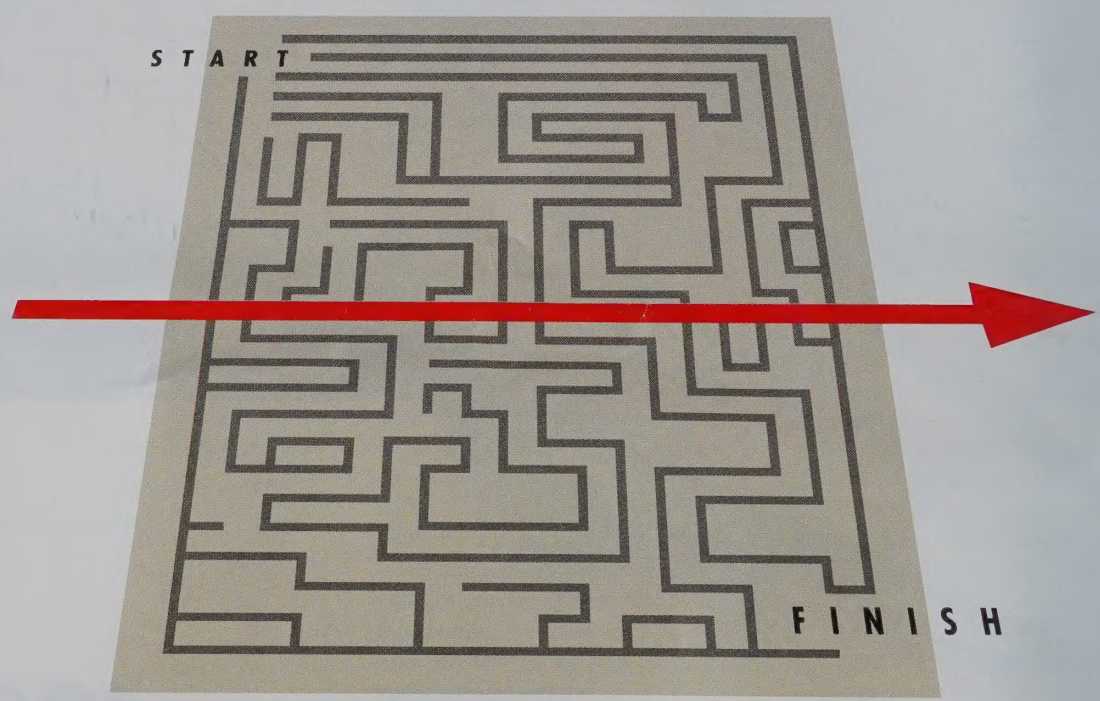
Teledyne's NEW Bypass Relays:



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They provide the user a TO-5 relay where one side of a double-pole, double-throw contact configuration has been internally connected. This provides an INTERNAL BYPASS rather than two isolated contact sets. Unlike the maze of external PCB connections, one of the contact conditions will pass the signal through uncorrupted.

Benefits include:

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- Lower return loss/VSWR through bypass.
- Repeatable insertion loss.
- A wide variety of configurations and options, all in rugged, cost-effective, space-saving packages.

These innovative bypass relays mark the end of two previous intrinsic signal path concerns. First, four connecting points are removed. Also, two changes of materials are eliminated. Together, these enhancements reduce the distance your signals must travel, maximizing signal integrity.

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9 ❑ Satellite Communications/ Telemetry (including GPS)
10 ❑ Automotive Electronics
11 ❑ Medical Equipment
12 ❑ Security Identification
13 ❑ Industrial Manufacturing/ Processing
14 ❑ CATV Broadcast Systems
15 ❑ Active Components
16 ❑ R&D Laboratories
17 ❑ Test & Measurement Equipment
18 ❑ Government/Aerospace
19 ❑ Military
20 ❑ Radar Systems
21 ❑ Lasers/Electro-Optical Systems & Equipment
22 ❑ Other (specify) 23/ _____

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31 ❑ Design/Development Engineering Management
32 ❑ Research & Development
33 ❑ Applications Engineering
34 ❑ Production Design & Development Engineering
35 ❑ Engineering Services
36 ❑ Corporate Management
37 ❑ Purchasing and Procurement
38 ❑ Consultants
39 ❑ Other (specify) 40/ _____

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72 ❑ Specify acceptable brands
73 ❑ Recommend vendors or brands
74 ❑ Evaluate products/services
75 ❑ Develop product specs

E. At what stage is your organization in the design process for the products you're involved with (check only one):

80 ❑ Concept
81 ❑ Definition
82 ❑ Breadboarding
83 ❑ Prototype
84 ❑ Manufacturing Model

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In the next 12 months, which of the following types of antennas and support equipment do you plan to purchase (check all that apply)?

01 ❑ Antenna Mounts/Clamps
02 ❑ Antenna Pedestals
03 ❑ Antenna Rotators
04 ❑ Antenna Towers
05 ❑ Antennas, Broadcast (Receive)
06 ❑ Antennas, Broadcast (Transmit)
07 ❑ Antennas, Directional
08 ❑ Antennas, Ground Plane
09 ❑ Antennas, Helical
10 ❑ Antennas, Horn
11 ❑ Antennas, Log Periodic
12 ❑ Antennas, Millimeter-Wave
13 ❑ Antennas, Parabolic
14 ❑ Antennas, Phased-Array
15 ❑ Antennas, Satellite Ground Station
16 ❑ Antennas, TVRO

Over the next 12 months, which types of waveguide equipment do you anticipate purchasing (check all that apply)?

17 ❑ Waveguide-To-Coax Adapters
18 ❑ Waveguide Fittings
19 ❑ Waveguide Pressurization Systems
20 ❑ Waveguide Supports
21 ❑ Waveguide Switches
22 ❑ Waveguide Windows
23 ❑ Waveguides, Electroformed
24 ❑ Waveguides, Flexible
25 ❑ Waveguides, Rigid
26 ❑ Waveguides, Solid-Dielectric

How many meters of completed waveguide, for all frequency bands, do you anticipate purchasing?

27 ❑ 1 - 10 28 ❑ 11 - 25 29 ❑ 26 - 100 30 ❑ 101 - 500 31 ❑ More than 500

In the next 12 months, which of the following types of cable do you anticipate purchasing (check all that apply)?

32 ❑ Coaxial, Small Diameter (RG-58 or smaller)
33 ❑ Coaxial, Medium Diameter (RG-213/214 or similar)
34 ❑ Coaxial, Large Diameter (7/8-inch or larger)
35 ❑ Fiberoptic, Multimode
36 ❑ Fiberoptic, Singlemode
37 ❑ Semi-Rigid
38 ❑ Cable Assemblies, Flexible

How will these cables be (primarily) purchased?

39 ❑ Primarily Preterminated
40 ❑ Primarily Raw Cable, To Be Terminated In-House

In what types of applications will these antennas and transmission-line hardware be employed (check all that apply)?

41 ❑ Automotive/Transportation
42 ❑ CATV Broadcast Systems
43 ❑ Computers & Peripherals
44 ❑ Consumer Electronics
45 ❑ Datacom Systems
46 ❑ Satellite Communications
47 ❑ Industrial Control
48 ❑ Industrial Security
49 ❑ Medical
50 ❑ Military
51 ❑ Personal Communications Networks
52 ❑ Personal Communications Services
53 ❑ Production Systems
54 ❑ RF Identification Systems
55 ❑ Telecom Systems, Cellular
56 ❑ Telecom Systems, Noncellular
57 ❑ Test & Measurement Equipment
58 ❑ Wireless LANs & Data Systems

In which of the following frequency ranges will these devices be used (check all that apply)?

59 ❑ Less than 200 MHz
60 ❑ 450 MHz (ISM, POS)
61 ❑ 800 - 950 MHz (cellular radio, cellular phone, ISM, paging, CDPD)
62 ❑ 200 MHz - 1 GHz (not including above)
63 ❑ 1.5 GHz (GPS)
64 ❑ 1.8 GHz (DECT)
65 ❑ 1.9 GHz (to 2.0 GHz)
66 ❑ 2.0 GHz (PCS)
67 ❑ 2.4 GHz (ISM, WLAN)
68 ❑ 5.2 GHz (Hiperlan)
69 ❑ 5.8 GHz (ISM)
70 ❑ 1 - 8 GHz (not associated with above)
71 ❑ 8 - 18 GHz
72 ❑ 18 - 40 GHz
73 ❑ More than 40 GHz

What is the approximate size of your budget for antennas and related transmission-line hardware over the next 12 months?

74 ❑ More than $1 million
75 ❑ $500,001 - $1,000,000
76 ❑ $250,001 - $500,000
77 ❑ $100,001 - $250,000
78 ❑ $50,001 - $100,000
79 ❑ $25,001 - $50,000
80 ❑ $10,001 - $25,000
81 ❑ $5,000 - $10,000
82 ❑ Less than $5,000

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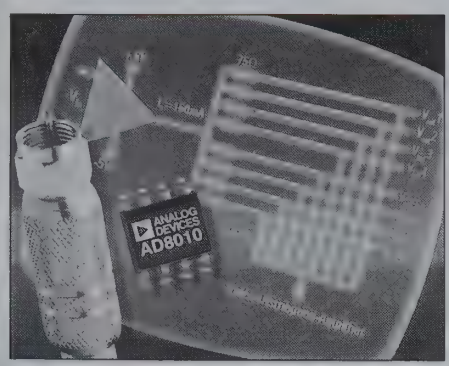
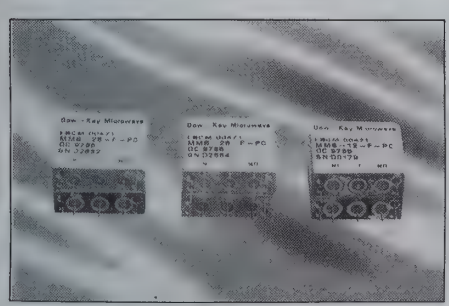


High Speed Amplifiers

Analog Devices introduced its AD8010, a high current output, high-speed amplifier. Capable of driving 160 mA of output current, the AD8010 amplifier can source eight parallel 75 ohm loads or more while maintaining its stringent video specifications. The amplifier's current feedback design provides impressively low distortion, gain error and phase error. Total harmonic distortion is -72 dBc at 1 MHz while driving an 18.75 ohm load. Amplifier gain is flat to within 0.1 dB at up to 40 MHz, with differential gain error of 0.02% and differential phase error of 0.03°. The AD8010 high-speed amplifier features a 280 MHz (-3 dB) bandwidth, an 800 V/µs slew rate, and an output swing of ±2.5 volts. It uses a ±5 volt dual supply and consumes only 16 mA of supply current.

Analog Devices, Inc.

More Information - Write In 114



SPDT Coaxial Switch

Dow-Key Microwave announces the release of its MMS-28-F-PC SPDT coaxial switch. This low cost, microminiature switch (0.75 × 0.75 × 0.25″) can be used for hot switching amplifiers at 50W up to 1 GHz. Its small size allows it to be soldered onto a PC board. Applications range from cellular to PCN/PCS. Specifications include frequency from DC to 12.4 GHz, VSWR is 1.5:1 max., insertion loss is 0.5 dB max., isolation is 50 dB min., and switching time is 12 mS.

Dow-Key Microwave Corporation

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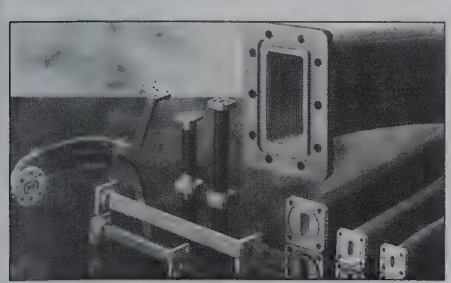
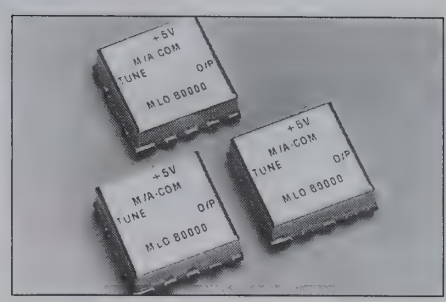


Flexible/Twistable Waveguide

Quasar flexible and flexible/twistable waveguide is used in a wide variety of commercial applications. It is designed to isolate vibration, to eliminate installation difficulties caused by misalignment and to provide a simple aid to positioning and alignment of parabolic reflectors in line of sight, microwave radio links. Additional mechanical support is offered through the availability of a variety of protective jacket materials such as Neoprene, Silicone, Viton, Devcon etc.

Quasar

More Information - Write In 116



Surface Mount Voltage Controlled Oscillators

The MLO81100-01550 is a fundamental single ended oscillator designed for use in cost sensitive wireless and telemetry applications. The device has been optimized by careful selection of the bipolar transistor and varactor diode for low phase noise and high linear tuning characteristics. The low profile surface mount package used provides for electrical shielding, ease of assembly and repeatable performance. Frequency range is between 1500-1600 MHz. Tuning voltage is 0.5-4.5 V. All specifications apply with a 50 ohm load impedance.

M/A-COM

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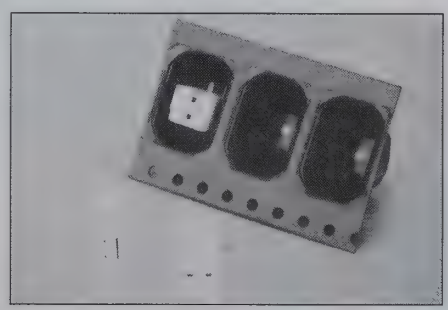
Logic Products

Cypress Semiconductor introduced 3.3-volt and E-Speed device families comprised of 46 new products. Cypress's new logic devices include buffers, transceivers, registers and latches. The 3.3V products offer 5V-tolerant inputs and outputs, making them an ideal solution for interfacing 3.3- and 5V busses in applications such as routers, hubs and network interface cards where 5V logic often controls 3.3V memory busses. Cypress's new family of E-Speed products offers propagation delays as low as 3.2 ns, and are targeted at high-speed networking and computer applications. The devices are manufactured in Cypress's RAM3™ manufacturing process.

Cypress Semiconductor

More Information - Write In 118



Eurostyle PCB Connectors

Thomas & Betts recently introduced a line of economical "direct screw" Eurostyle PCB connectors. Offered as a lower cost option across the entire Eurostyle product family, the new contact style completes the electrical connection by tightening the screw directly against the signal wire where it enters the connector's contact area. Thomas & Betts' Eurostyle connectors carry UL, CSA, CD and European approvals, and feature one-piece wire tube and solder-pin construction to enhance circuit integrity and minimize I^2R loss. Molded in either blue or black UL94 V-0 rated thermoplastic housing materials, they are rated for operation from -30°C to +105°C.

Thomas & Betts

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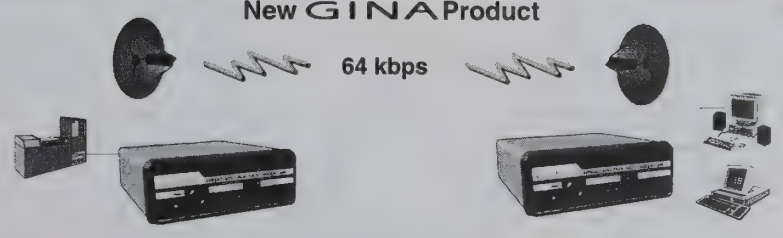
New GÍNA Product



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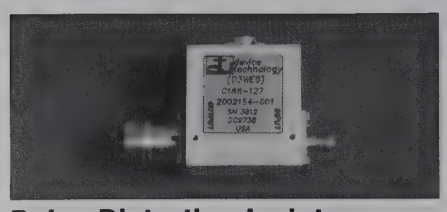

Delay Distortion Isolators

These isolators are designed to provide a very low group delay distortion and low RFI leakage over the specified frequency range. The C168-127 units have a 1.15:1 VSWR and an insertion loss of 0.3 dB maximum. The insertion loss variation slope is 0.005 dB/MHz maximum over any 60 MHz segment. These units have group delay distortion of less than 25 ps peak-to-peak and can provide broadband performance with a variety of connector configurations.

Device Technology

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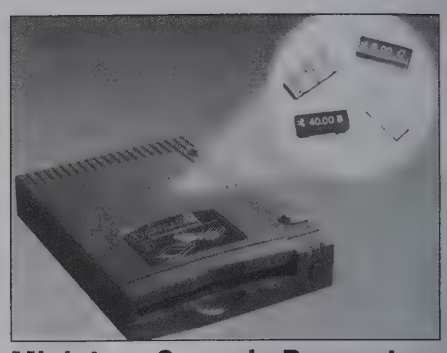
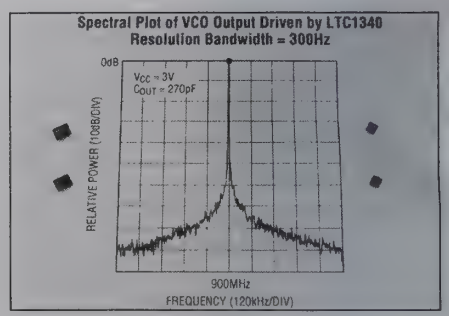


Miniature Ceramic Resonator

AVX has extended the frequency range of its "PBRC"Series all-ceramic resonators to 40 MHz, offering system designers a cost-effective surface mount alternative to quartz crystals for oscillation frequency stabilizations. The low-profile (1.6 mm) ultra-miniature "PBRC" Series resonator, is ideal for applications where board density and maximum height are critical. Primary applications for the SMT ceramic resonator include telecommunications, computers, computer peripherals, appliances and automotive.

AVX Corporation

More Information - Write In 124

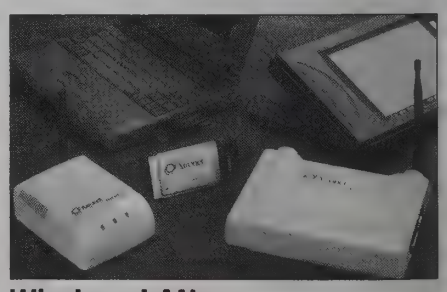


Varactor Diode

The LTC1340 is a varactor diode driver specifically targeted for Phase Locked Loop (PLL) frequency synthesizers in GSM cellular phone applications. From a 3V supply, it generates a 5V supply rail to the internal varactor drive amplifier by means of a charge pump. The low noise amplifier has a gain of 2.3, allowing the smaller output voltage of the synthesizer phase detector to drive the varactor diode with a wider voltage range, and therefore a wider tuning range. The LTC1340 is ideal for enhancing cellular phone operation on 3V supplies and in wireless modems for Internet and PC-to-base-station wireless networking applications.

Linear Technology Corporation

More Information - Write In 125



Wireless LANs

Aironet Wireless introduced the first in a succession of products that comply with the IEEE 802.11 standard. Called the Aironet 3500 Series, this wireless product line offers network designers a complete arsenal of wireless solutions to extend network resources to wherever they are needed. The Aironet 3500 Series includes Access Points, PC Cards and other stand alone wireless adapters. All of these 2.4 GHz FHSS components comply with the new IEEE 802.11 wireless standard. Supporting 1 or 2 Mbps data rates, the Aironet 3500 Series offers superior range, unmatched throughput and low power consumption in Ethernet and Token Ring environments.

Aironet Wireless Communications, Inc.

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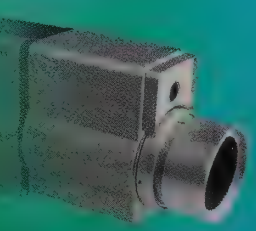

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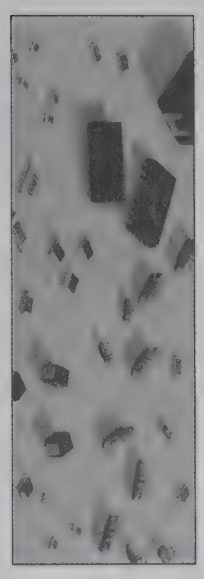

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election for Cell Sites

Choosing the correct base station antenna for a sectorized site can be confusing. It is not always better to choose the one that looks the best at a glance.

ILLUSTRATION BY PAUL ANDERSON

By Rick Good and John Kadingo, Decibel Products Division of Allen Telecom Inc.

One challenge that system engineers face when planning sectored cell sites is choosing the correct base station antennas for their application. Depending on the location of the site, the coverage requirements can vary from a very small area to many miles. The antenna is one of the main contributors in determining the amount of area a site will cover.

When choosing an antenna there is a multitude of characteristics that must be considered. Some of the most common features that are carefully thought about are 3 dB (half-power) beamwidth, gain, frequency and size. Other factors that are less common and many times not taken into account are null-fill, upper sidelobe suppression and performance verses specification. All of these features are important and must be thought about when deciding what antenna to use. Some of these characteristics have a direct relationship on others and in some instances trade-offs must occur when choosing the performance requirements of the antenna.

Sectored cell sites typically use directional panel antennas. Panel antennas have finite horizontal pattern coverage and finite elevation pattern coverage. The aperture of the antenna pattern determines the theoretical area the cell will cover. Antenna apertures are typically defined in terms of 3 dB beamwidth. The 3 dB beamwidth is the angle of coverage where the radiated energy is 3 dB down from the peak of the beam.

Stacking individual antenna elements in a vertical array is a common method of controlling the elevation beamwidth in panel antennas. The more elements stacked vertically, the flatter the vertical pattern and the higher the antenna gain (see Figure 1). The horizontal beamwidth is typically controlled using directors or reflectors. In some cases, the horizontal aperture is shaped by arraying elements side by side. This method is more common on antennas with extremely narrow horizontal apertures. As with the elevation beamwidth, when the horizontal aperture is decreased, the gain of the antenna increases. This can also be seen in Figure 1.

The antenna is one of the main contributors in determining the amount of area a site will cover.

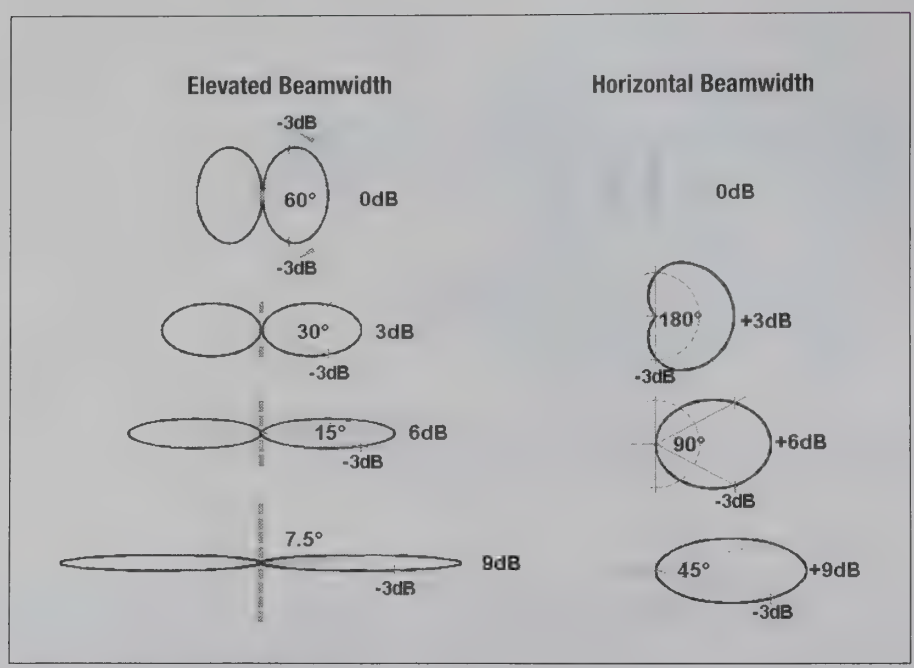

Figure 1. Principles of Antenna Gain.

# of Radiators vertically spaced (.9λ)	Vertical Aperture	3dB Horizontal Aperture (Influenced by Grounded Back "Plate")								Typical Length of Antenna (ft.)	
		360°	180°	120°	105°	90°	60°	45°	33°	800/900 MHz	DCS 1800 PCS 1900
1	60°	0	3	4	5	6	8	9	10.5	1'	0.5'
2	30°	3	6	7	8	9	11	12	13.6	2'	1'
3	22.5°	4.5	7.5	8.5	9.5	10.5	12.5	13.5	15.1	3'	1.5'
4	15°	6	9	10	11	12	14	15	16.6	4'	2'
6	11.5°	7.5	10.5	11.5	12.5	13.5	15.5	16.5	18.1	6'	3'
8	7.5°	9	12	13	14	15	17	18	19.6	8'	4'

Could be horizontal radiator pairs for narrow horizontal apertures.

Figure 3. Theoretical Gain of Antennas (dBd).

Gain is a typical method for describing the overall performance and efficiency of an antenna. Gain is commonly provided in terms of dBd or dBi. The dBd is the gain with reference to a standard dipole and dBi is the gain with reference to an isotropic radiator. An isotropic radiator is a radiating element with equal energy radiated in all directions and has a gain of 0 dBi. A standard dipole is estimated to have approximately 2.1 dBi or 0 dBd. Figure 2 pictorially shows the difference between gain in dBi and gain in dBd. By referencing antenna gain to either of these known standards, it is easy to compare the performance of one antenna to that of another.

Gain is a typical method for desribing the overall performance and efficiency of an antenna.

The length of a base station panel antenna is determined by two major factors, frequency of operation and number of elements required to provide the desired gain and elevation beamwidth. For optimal performance of a vertically stacked antenna array, each element is spaced approximately 0.9 wavelengths apart. If the elements are spaced much closer than that, the ends of the elements will couple together canceling the effective radiation and cause a reduction in gain.

Antenna gain and beamwidth are inversely related to each other. As the beamwidth narrows, the gain increases. Each time the number of elements in the array is doubled the gain of the antenna theoretically goes up by 3 dB and the vertical beamwidth is reduced to half. For example, a single element dipole antenna (with 360-degree horizontal coverage) has a vertical beamwidth of approximately 60 degrees and the gain of the antenna is 0 dBd or 2.1 dBi. If two elements are arrayed together vertically and the horizontal aperture remains constant, the vertical aperture decreases to approximately 30 degrees and the gain increases to 3 dBd or 5.1 dBi. For four elements, the gain is increased by another 3 dB and the vertical beamwidth halves again.

The horizontal beamwidth reacts in a fashion similar to the vertical beamwidth. A dipole element spaced approximately 1/4 wave off an antenna back-plate will provide a horizontal beamwidth of about 90 degrees and a vertical beamwidth of about 60 degrees. The gain of this antenna will be about 6 dBd. This can be determined by using the basic theory of "each time the beamwidth is cut in half, the gain increases by 3 dB". A standard dipole with 60 degrees elevation beamwidth and 360 horizontal had 0 dBd gain. The horizontal beamwidth was cut in half twice to 90 degrees therefore increasing the gain by 6 dB. Figure 3 shows theoretical gain of antennas given the horizontal beamwidth and the number of elements stacked vertically.

The gain of an antenna is defined by its beamwidths and efficiency. At no time can the gain of the antenna exceed the theoretical values in Figure 3. The actual gain of the antenna will be slightly lower than theoretical due to losses within the antenna. It should also be noted that as the number of elements becomes very high the increase in gain for added elements becomes less prevalent. The increase in number of elements results in higher losses in the feed network reducing the benefits of adding more elements. If the loss in the feed network increases by 3 dB when the number of elements doubles, no benefits in gain will be seen.

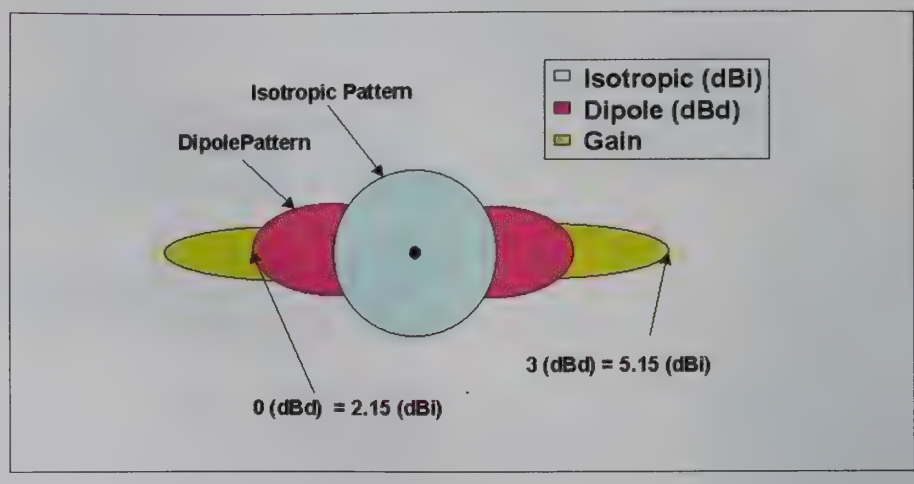

Figure 2. Gain References (dBd and dBi).

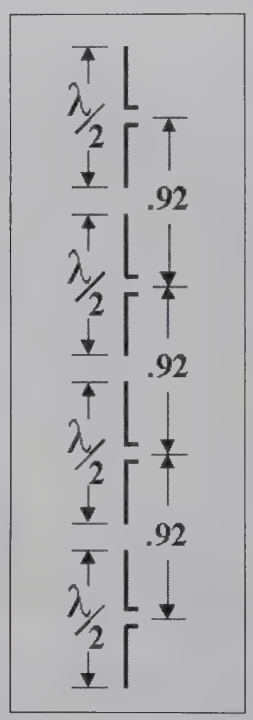

Figure 4. Four Element Dipole Array.

The approximate size of an antenna can be estimated if the frequency of operation, gain and horizontal aperture are known. As a rule of thumb a wavelength in inches is approximately 11,808 divided by the frequency in megahertz. At cellular frequencies a wavelength is about 13.75 inches and at PCS frequencies a wavelength is about 6.2 inches. Because of the difference in wavelength, it is common for antennas operating at low frequencies to be larger than those operating at higher frequencies. Cellular antennas are usually about twice the size of 1900 MHz PCS antennas for similar performance.

Antenna elements are typically 1/2 wavelength long when stacked in vertical arrays and spaced approximately 0.9 wavelengths apart. With this in mind, a two-element array at cellular frequencies should be about 1.5 wavelengths long (approximately 24 inches). A four-element array at PCS frequencies should be a minimum of about 24 inches long (see Figure 4). Even though the antennas are the same length, if the horizontal apertures are the same, the gain of the PCS antenna will be approximately 3 dB higher than that of the cellular antenna because there are twice as many elements.

Upper sidelobe suppression and null fill are two enhancements that can be provided with many antenna arrays but are commonly not specified on data sheets or in antenna catalogs. Upper sidelobe suppression is typically defined as a reduction of energy in the first lobe above the main beam. This is used to reduce co-channel interference with nearby sites. Null fill is defined as a reduction in depth in the first null below the main beam. The combination of upper sidelobe suppression and null fill directs more of the radiated energy from the antenna below the main beam toward the user.

Incorporating upper sidelobe suppression and null fill does not come without its trade-offs. Typically the gain of the main beam gain will decrease by approximately 1 dB when the antenna is optimized with upper sidelobe suppression and null fill. Even with this dB of loss, the benefits typically outweigh the loss in gain.

When choosing an antenna it is important that the engineers know exactly what they are getting. Many manufacturers specify antenna performance on minimum gain over the frequency while others specify a typical gain. When looking at a data sheet on each of these antennas, it could be misleading as to which one is the better choice. Another factor to look at when considering antenna gain is whether the antenna has pattern enhancements (upper sidelobe suppression and null fill) or not. When comparing two antennas with equivalent beamwidths, one may be specified to have higher peak gain than the other. This may look good for overall coverage distance but without null fill there could be areas inside the coverage area that have low signal strength. It is not always better to go for the antenna that looks the best at a glance.

For those engineers that model their cell site coverage on computers, they should request actual test patterns from their antenna vendors. Many manufacturers provide patterns in electronic formats that are compatible with most of the modeling software available. Some of the manufacturers have their patterns available on the Internet for easy interactive access and review. Keep in mind that this data can be simulated data or actual test data. Actual test data is the most accurate to use when comparing antennas or modeling sites.

Rick Good and John Kadingo are product managers for the Decibel Products Division of Allen Telecom Inc., located in Dallas, TX.

More Information - Write In 300

RF Micro Devices Presents

Not So

Great Moments in Wireless Communication

1621 A.D. – A windswept mesa, the open plain, a cloud-studded sky. A solitary scout tracks the herd, while the hunting party awaits his signal.

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Digital Multimeters

Fluke Corporation introduced its 70/20 Series III Digital Multimeters (DMMs) for use in a variety of electronic and electrical applications. These DMMs are ergonomically designed to provide stable results in harsh, industrial environments and feature a new tapered design, overmolding, large high-contrast screens. They comply with the IEC 1010-1 safety category ratings based upon the ability of meters to withstand power surges and high voltage transients. The DMMs feature a large, high-contrast screen and segmented bargraph for easy reading. The automatic Touch Hold® feature allows the user to focus attention on the test probes while the meter automatically freezes the reading and beeps when the measurement is captured.

Fluke Corporation

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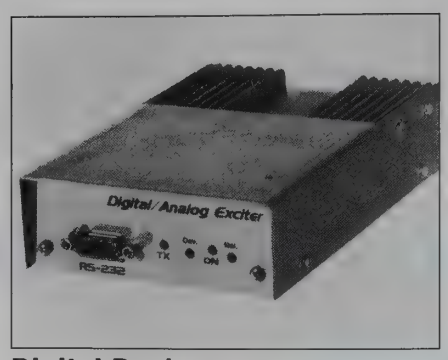

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RF Neulink

More Information - Write In 129

Introducing Maxtek Power Amplifiers for Cellular and PCS Infrastructure – Linear Power for Less

Maxtek Part #	Frequency MHz	Class	1dB Comp. (dBm)	Gain (dB)	Gain Flatness (dB)	IP3 (dBm)	I/O Return Loss (dB)	Supply Req'd (v/mA)
MXT20900-43	864-899	A	31	22	+/-0.1	43	18	15/600
MXT20960-01	925-960	A/B	39	28	+/-0.5	N/A	10	26/200
MXT20960-02	925-960	A	31	22	+/-0.1	43	18	15/600
MXT20900-40	864-899	A	24	16	+/-0.2	40	16	15/100
MXT20900-50	820-920	A	33	27	+/-0.2	50	16	15/650
MXT21900	1930-1990	A	33	22	+/-0.1	48	18	15/650

Maxtek builds high performance, cost effective Power Amplifiers. They are fabricated using a proprietary active trim process to achieve optimal intercept points required for transmission line-ups for cellular and PCS infrastructure. Maxtek's unique "Building Block" design concept and expertise in high frequency design allow Maxtek to incorporate other custom components within the PA module, including T/R switches, filters combiners for multiple PAs, couplers and even Up and Down converters.

Whether your system designs serve AMPS, IS54, IS95, GSM, DECT or PCS, Maxtek has a power amplifier solution for you.

Call 1800 4 MAXTEK for further information.

Fax 503-627-4657 **e-mail:**wireless@maxtek.com

http://www.maxtek.com

Maxtek Components Corporation
A Maxim/Tektronix Company
13335 SW Terman Road, PO Box 428, Beaverton, OR 97075. Ph: 503-627-1975

Maxtek

More Information - Write In 132

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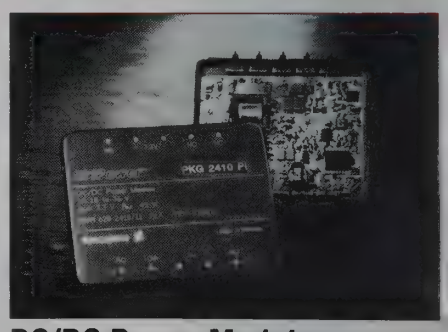
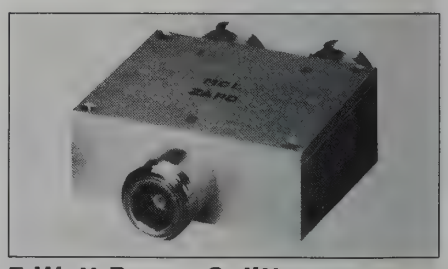


DC/DC Power Module

The 3.3V output PKG 2410 PI from Ericsson Components provides a high power 24V input solution for distributed power in advanced digital systems which include the latest low voltage devices. The advanced control circuitry of the PKG family of DC/DC power modules provides the fast transient response and high peak power capability essential for advanced high speed digital processing applications. The 46W unit will deliver its full 14A output, without additional heatsinking up to 60°C ambient, with only 1 m/s air flow. This DC/DC converter delivers line and load regulation of only 10 mV and 35 mV respectively, and typical ripple of only 60 mV peak to peak, while the integrated control electronics provide a fast load transient response of 100 µs for optimum dynamic performance.

Ericsson Components

More Information - Write In 130



5 Watt Power Splitter

Mini-Circuits introduces the high power 2-way, 0° power splitter. Model ZAPD-900-5W covers the 100 to 900 MHz frequency range with 23 dB isolation, amplitude and phase unbalance of 0.1 dB and 0.2 degrees respectively, and low VSWR of 1.15:1 at input and 1.22:1 at output (all typ.). Insertion loss is very low, typically 0.3 dB (above 3 dB), and isolation is high at 23 dB (typ.). This 5 watt (max.) connectorized unit is housed in a non-hermetic metal package equipped with type N female connectors.

Mini-Circuits

More Information - Write In 131

Our smallest Xingers yet just cropped up.

Xinger®

Just as farmers bump up their crop by working their fields — we've strengthened our line-up of Xinger® surface mounts by responding fast to what our Reps are hearing in the wireless field.

The consensus?

"Xingers are cool, but can you make them even smaller so we can do more with them?"

You bet.

Check out our all-new 1.9 GHz PCS coupler. At only 0.56" x 0.20" x 0.075", it'll fit like a glove into wireless PBX terminals. Base station LNAs. Heck, a dozen of them will now fit on a multi-carrier PA board with room to spare for other components... No home-grown hassles. No performance tradeoffs on smaller, but lesser, solutions.

Or for wireless LAN designers, there's our equally tiny, new 2.4 GHz ISM band coupler — for use in WLAN access points, cellular boosters for wireless handsets, or any number of wireless devices finding their way into manufacturing, distribution, and healthcare these days.

Not just because innovation's our thing. But because innovation is your thing.

Xinger® surface mounts, exclusively from Anaren. What'll we think of next?

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In Europe, call 44-1705-232392.
Visa/Mastercard accepted.

Anaren

More Information - Write in 420

All new 1.9 GHz couplers, at half the size.

All-new Xinger® 1.9 GHz surface mount couplers measure up at a mere 0.56" x 0.20" x 0.075" — yet they offer big performance:

- > PCS, LNA, and PA applications
- > Low .25 dB max insertion loss; 1 degree phase balance; +/- .2 dB amplitude balance; 23 dB min isolation; and a max VSWR of 1.18:1
- > Performance is backed by our exclusive 100% OnSpec® guarantee.
- > Cost-competitive in volume
- > And our B-There® service commitment ensures on-time delivery — plus free samples in 24 hrs. for qualified prototype work.

Xinger® surface mounts. What'll we think of next?

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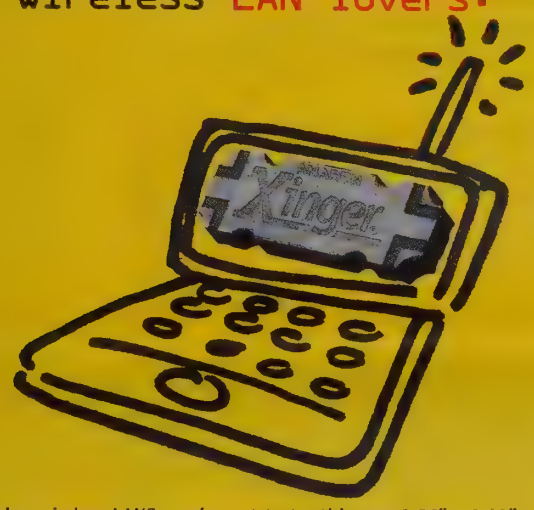
More Information - Write in 417

New 2.4 GHz ISM-band coupler for wireless LAN lovers.



If you design wireless LANS, you've got to try this new 0.56" x 0.20" x 0.075" Xinger® surface mount on for size:

- > ISM band, LNA and PA applications
- > Low .25 dB max insertion loss; 1 degree phase balance; +/- .2 dB amplitude balance; 23 dB min isolation; and a max VSWR of 1.18:1
- > Performance is backed by our exclusive 100% OnSpec® guarantee.
- > A great price, in volume
- > Plus, our B-There® service commitment ensures on-time delivery — plus free samples in 24 hrs. for qualified prototype work.

Xinger® surface mounts. What'll we think of next?

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Anaren

More Information - Write in 418

High-power handling. In a highly durable package.

Major power handling. Major physical integrity. That's the all-new Xinger® high-power coupler, measuring in at a miniscule 0.65" x 0.48" x 0.14":

- > PCS and Cellular bands, PA applications
- > Up to 150 watt power handling
- > Low .2 dB max insertion loss; +/- .3 dB amplitude balance
- > Performance is backed by our exclusive 100% OnSpec® guarantee.
- > A surprisingly low price, in volume
- > Plus, our B-There® service commitment ensures on-time delivery — and free samples in 24 hrs. for qualified prototype work.

Xinger® surface mounts. What'll we think of next?

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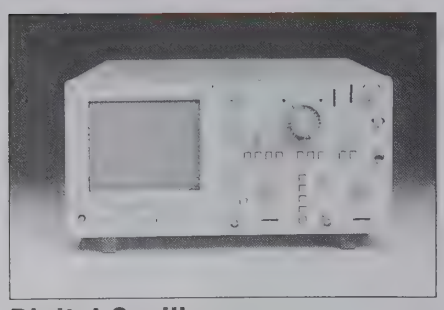

Digital Oscilloscope

The Electronic Measuring Systems group of Panasonic Factory Automation company has introduced the VP-5567A, a 100 MHz analog oscilloscope with a full array of features for laboratory and production settings. The VP-5567A comes with a bright cathode ray tube with autofocus, for clear, crisp waveform analysis. It operates at a bandwidth of DC to 100 MHz, with 3-channel, 6-trace capability. The VP-5567A's vertical fine magnifier is capable of magnifying tiny voltage changes buried in the signal—with large amplitude, up to 5 times vertically. A range of trigger couplings (DC, AC, TV) and trigger modes (AUTO, NORM) make the VP-5567A easy to operate. Ideal for magnified observation of the pulse waveforms of microprocessor, video and other complicated signals.

Panasonic Factory Automation

More Information - Write In 150

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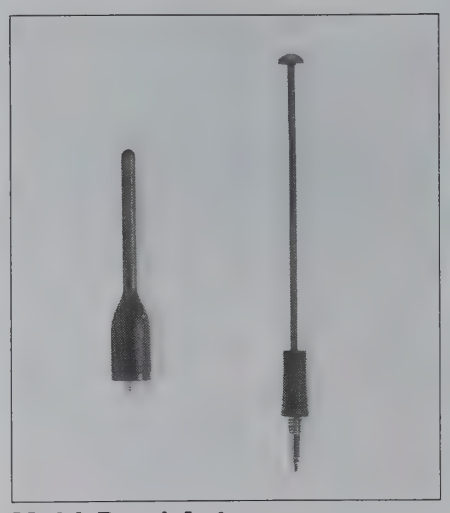
Handset Development Kits for GSM and AMPS

CommQuest Technologies is now offering OEM Development Kits for accelerated cellular handset development. The OEM Development Kits, one for GSM and one for AMPS, consist of all the pieces necessary to develop a cellular handset. Each kit includes the company's highly integrated "Total System Solution" chipset, a Reference/Evaluation Board, system tested reference designs, complete software package, and a comprehensive manufacturing test tool set. The Development Kits provide handset design engineers all the tools needed to reduce development effort and to fully evaluate the capability of our total system solution chipsets and software.

CommQuest Technologies, Inc.

More Information - Write In 151



Multi-Band Antennas

Centurion introduces a portable multi-band retractable and fixed antenna for most popular cellular and PCS phones. Based on the Centurion ECPU (retractable) and fixed cellular antenna styles, these three styles are designed, engineered and manufactured for dual-band phones. The patented ECPU (retractable) multi-band antenna operates as a 1/2 wave at DCS/PCS and as a 1/4 wave in AMPS/GSM modes and features integral impedance switching. The 65 mm long dual band fixed antenna is 1/2 wave on PCS and DCS and 1/4 wave for AMPS/GSM with a self-contained matching circuit requiring no additional matching in the phone. The 30 mm long stubby multi-band antenna is a 1/4 wave at both PCS and cellular, and also requires no additional matching in the phone.

Centurion International, Inc.

More Information - Write In 152

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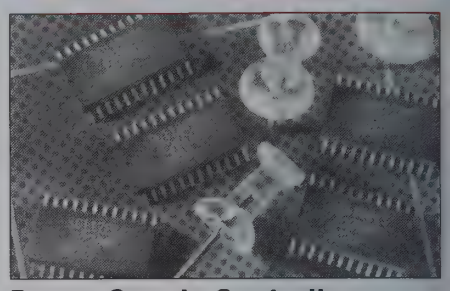


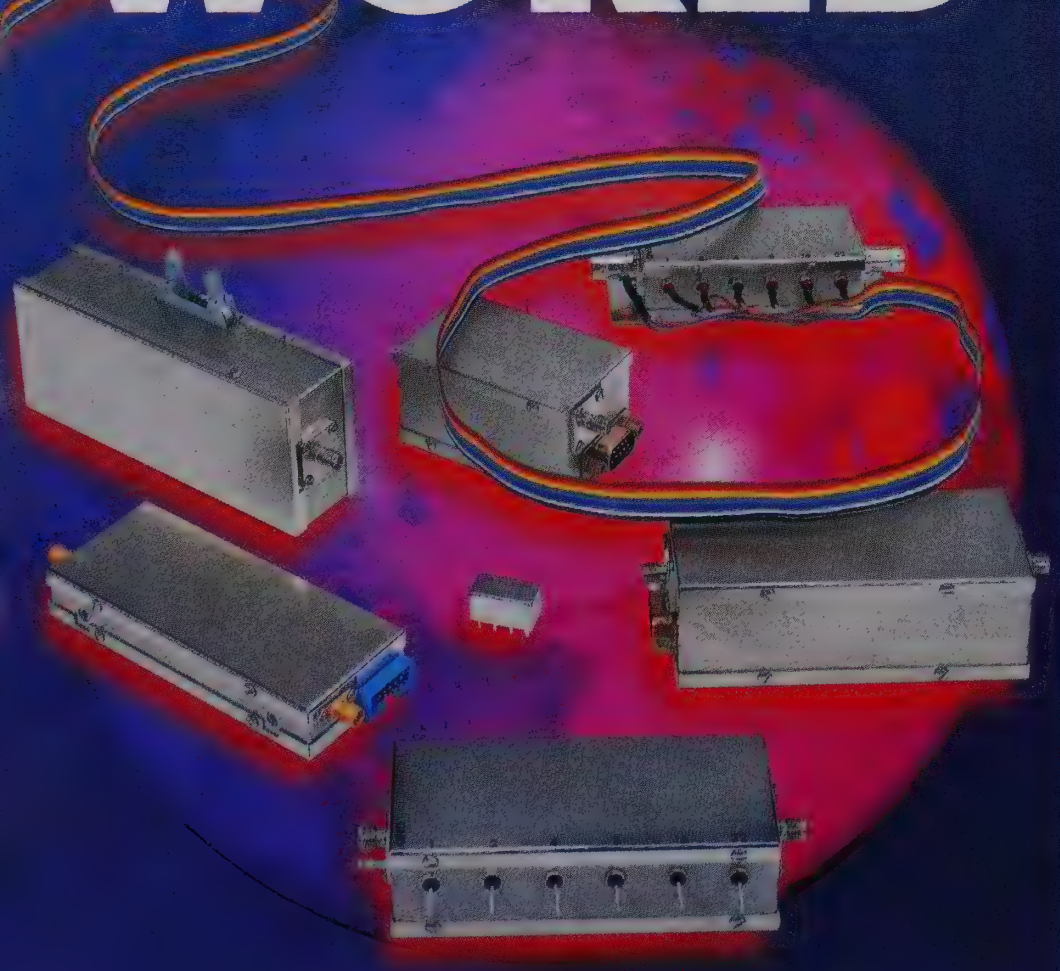
Power Supply Controllers

Semtech announced the availability of its integrated SC1182, SC1183, SC1172 and SC1173 Synchronous Rectified Power Controllers. Featuring a highly-efficient DC/DC converter with low dropout (LDO) regulators, these programmable devices are a low cost, integrated controller/regulator combo for advanced microprocessors including the Pentium II (Klamath) or Deschutes CPUs. The four parts merge switching and linear sections into a single chip. The switching portions feature an integrated 5-bit D/A converter, while the linear portions consist of high performance low dropout regulators that can provide single or dual output supplies, in fixed or adjustable configuration. The D/A converter provides programmability of the output voltage between 1.3 and 3.5 V without the need for external resistor arrays and jumpers.

Semtech Corporation

More Information - Write In 153

WORLD CLASS.



- *New* DC-2500 MHz Low Cost/High Performance series
- Solid-State, wide band models
- Models with frequency ranges up to 5Ghz
- GPIB controlled models available
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More Information - Write In 154

MORE LARSEN INNOVATION...

Larsen...it all starts here.

For Wireless Developers:

Nothing can be more frustrating than moving a new system design into field test, and finding that your electrical performance or radiating range just doesn't cut it! Fact is, it's one thing to calculate antenna performance in the lab, but field results are where it really counts!

We have been helping our OEM partners design innovative antenna solutions for over 30 years. As antenna experts, we know that actual performance numbers often lag theoretic values. . .in some cases by a wide margin!

Since our business is focused only on antennas, our knowledge runs deep. This experience can save both time and money. Time you can use to beat your competition to the marketplace. Money you can use to fund additional projects that extend your presence in new and existing markets.

Our Advice: Start Early!

The best advice we can give when it comes to antenna design is to bring in the experts right from the start. The sooner we're involved, the more design options are available. Often this is the key to meeting cost and performance targets.

Design Goals

The first step is to call our engineer team. Using our Custom Antenna Development Guide, we will work with you to develop a complete description of your design goals. Our RF Antenna Design Specialists will compare your objectives to both theoretical and practical solutions. Our first cut review will help form final design targets and save you valuable development time.

Production Objectives

Once a design path is selected, access to our skilled technical team is just one part of the bargain. Our ISO 9001 registered production facility is recognized for it's quick response. In the fast paced wireless world, this often makes the difference at crunch time. Offering both capacity and skill, we are prepared to meet your needs for timely product deliveries.

Long Term Partner

We believe that we only win when your system is successful in the market. From concept to delivery, we are with you every step of the way. Give us a call. We'd like to be your antenna expert too!

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More Information - Write in 421

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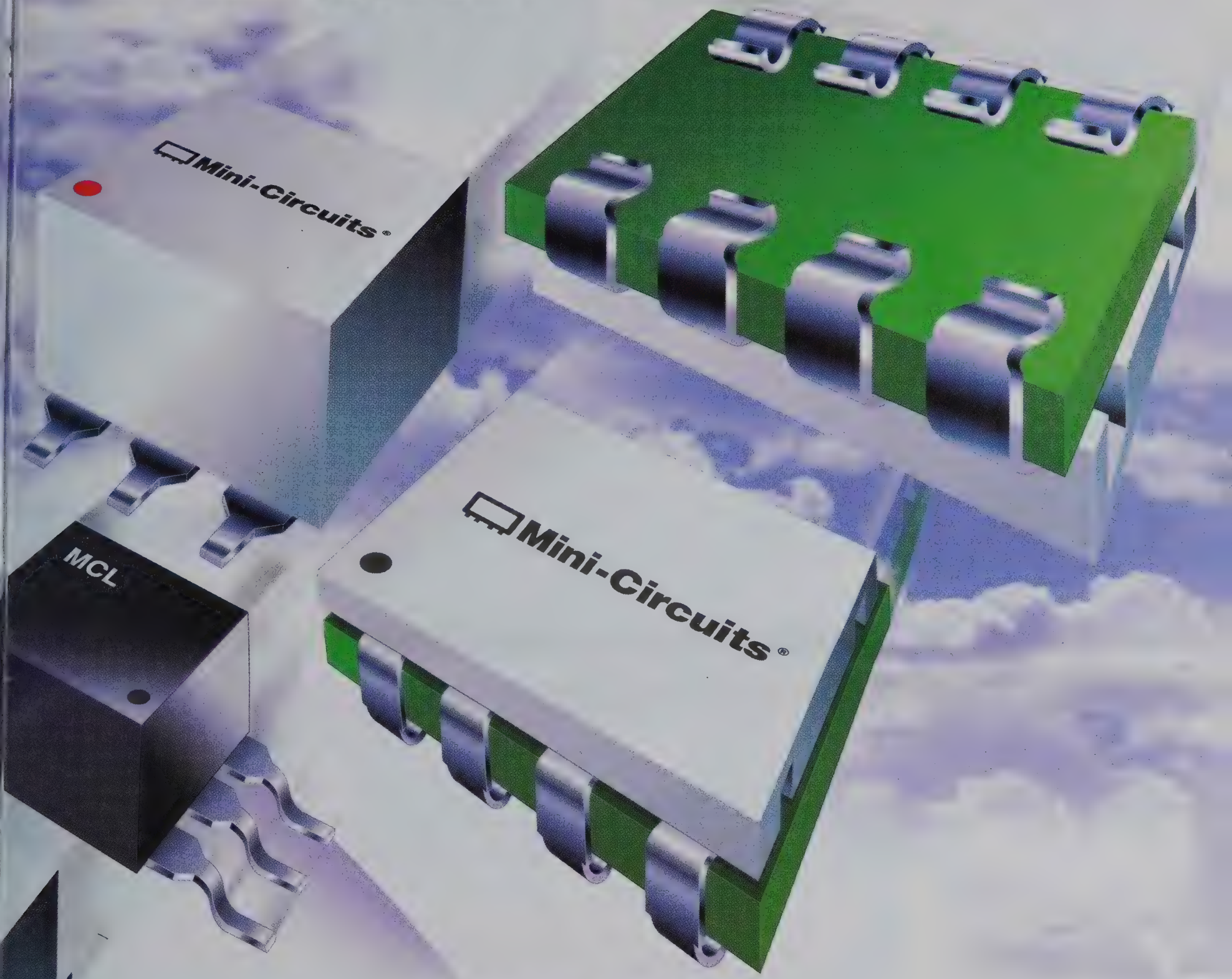
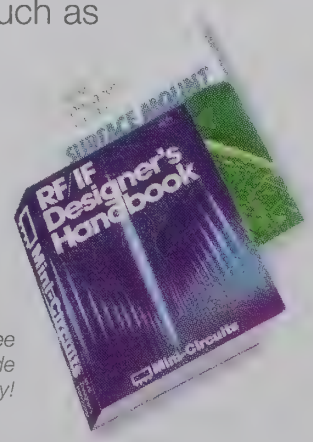


150kHz to 7000MHz

With Mini-Circuits phenomenal variety of surface mount mixers, you can select from hundreds of standard catalog and "special" models, with ***LO levels from +3 to +17dBm,*** and get the precise price/performance solution you need. Choose from tough built J-lead, gull-wing, universal claw, and leadless models with vast commercial and military applications such as telecommunications, radar, cable TV, PCS, FM, GPS, and ISM. And to assure that you're positively delighted with Mini-Circuits high quality, a 5 year Ultra-Rel® guarantee is included with every unit...an industry exclusive! You can count on Mini-Circuits too for custom designs, at catalog prices of course.
Need a reliable surface mount mixer that conforms to specs? Call Mini-Circuits today!

Mini-Circuits...we're redefining what VALUE is all about!



Call, write or fax for your free Surface Mount Designer's Guide and Handbook today!

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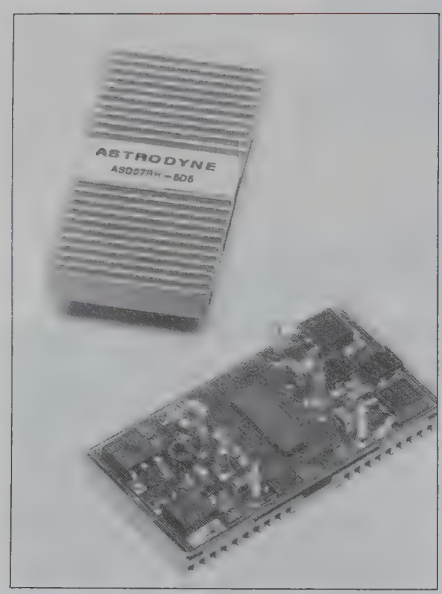

DC/DC Converters

ASTRODYNE introduces the ASD10H Series of open frame DC/DC converters that provide a new standard in design versatility for use in telecommunications, instrumentation, automotive and industrial applications. The ASD10H Series features wide 4:1 input ranges of either 9-36 VDC or 18-75 VDC and provides a full 10 watts of output power over the ambient temperature range of -25°C to +75°C. The ASD10H Series measures 1″ × 2″ × 0.375″ and features a unique open frame construction with integral finned heat sinking. Power shutdown (inhibit) pin function is standard. The ASD Series is also offered in 5 watt and 7 watt versions. A wide range of 5, 7 and 10 watt modules are available with single outputs from 3.3 to 15 V and dual outputs of 5 to 15 V.

ASTRODYNE

More Information - Write In 155

Cable Fault Locator

Riser-Bond announces the Model 1205CX Metallic TDR, Cable Fault Locator with a sub-nanosecond pulse width for increased sensitivity. The sub-nanosecond pulse width (smaller than 1 nanosecond) will enable the user to identify very small, often unsuspected faults that may be within inches of each other. Model 1205CX will troubleshoot and locate faults in all lengths of trunk, distribution and drop cables.

Riser-Bond Instruments

More Information - Write In 156

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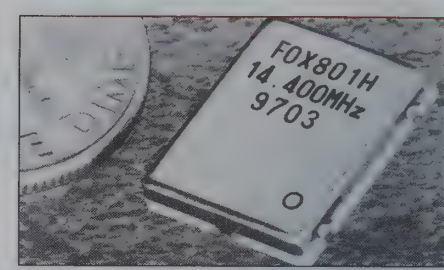

TCXO for Wireless Applications

A series of low-profile crystal oscillators for wireless and other applications has been introduced by Fox Electronics. The Fox 801 B/E/H Series TCXOs occupy the small footprint favored by the frequency control industry (SMD is 9.6 mm × 11.4 mm) with a profile only 2.0 mm high, making them well suited for any application where headroom is a critical consideration. These oscillators display frequency stability of ±2.5 PPM over a frequency range of 10.000 MHz to 22.000 MHz. Operating temperature range of the TCXOs is -30°C to +75°C; they can be safely stored at -35°C to +80°C. Both the B and E Series utilize an internal trimmer for frequency adjustments within ±3.0 PPM; the H Series is trimmerless.

Fox Electronics

More Information - Write In 157

AR® Accessories.

Peripheral Instruments for Total Test Set-Up.

Extend the integrity of your test with peripheral instruments from AR. Couplers, preamplifiers, and computer interfaces are power- and frequency-matched to our amplifiers and antennas. And other accessories—such as E- and H-field monitors, fiberoptic analog data links/CCTV systems, and test control software—give you more options than ever before.

Other important peripheral instruments include ARcell Precompliance EMC-Test Sets and Cells, PCB Emissions Scanners, and interference generators for IEC/ISO immunity testing.

To speak with an applications engineer, call (800)933-8181.

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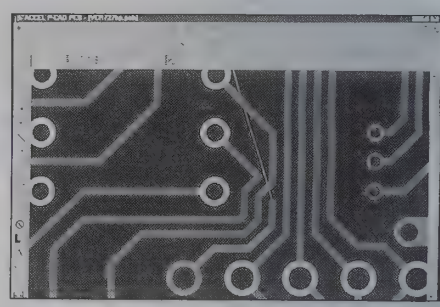
More Information - Write In 160



Interactive Router

ACCEL introduces the InterRoute Gold. This interactive router is the newest member of the ACCEL EDA family of PCB layout and design software for Windows. ACCEL InterRoute Gold helps board designers speed PCB layout with its high-end features, specifically addressing fan-out and bus and memory routing requirements as well as layout editing needs. ACCEL InterRoute Gold offers seven distinct interactive routing functions to ACCEL EDA users including Push Trace and Multi-Wire routing. ACCEL InterRoute Gold is an optional extension to no-cost interactive router now in ACCEL's PCB layout tools.

ACCEL Technologies, Inc.

More Information - Write In 158

Integrated Testing Environment

GTFS has announced the Imaging Sandbox, an integrated testing environment that facilitates imaging control system development. The Imaging Sandbox is a PC-based instrument designed to prototype and validate image processing sequences written with the functions of the IMAQ™ Vision Advanced Library (National Instruments). Featuring a ready-to-use virtual instrument (VI) and a VI library, the low-cost Imaging Sandbox can be used by IMAQ Vision programmers or by experienced users as a base structure for developing imaging applications. The Imaging Sandbox requires 16 MB RAM and a video card with a minimum resolution of 800 × 600 × 16 million.

GTFS Inc.

More Information - Write In 159

LESS is MORE

Fujitsu's high-performance PLLs offer a smaller solution with lower power consumption.

If you're looking for the right PLL solution for your latest wireless design, Fujitsu Microelectronics gives you more for less! Our low power E, F and S series PLLs are ideal for your cellular, cordless and PCS digital wireless applications. Our new BCC packages complement Fujitsu's large portfolio of PLLs, continuing our tradition of delivering quality frequency synthesizers.

Fujitsu's E, F and S PLLs

Fujitsu Part Number	Input Frequency MHz	Vcc volts	Icc mA	Available Package Types
Single PLLs				
MB15E03	1200	3	3.5	SSOP-16, BCC
MB15E03L	1200	3	2.5	SSOP-16, BCC
MB15E05	2000	3	6	SSOP-16
MB15E05L	2000	3	4	SSOP-16, BCC
MB15E06	2500	3	8	SSOP-16
MB15E07	2500	3	8	SSOP-16
MB15E07L	2500	3	4.5	SSOP-16, BCC
Dual PLLs				
MB15F02	1200/500	3	6	SSOP-16, BCC
MB15F02L	1200/250	3	4	SSOP-16, BCC
MB15F03	2000/500	3	9	SSOP-16, BCC
MB15F03L	1800/250	3	5	SSOP-16, BCC
MB15F04	2000/2000	3	11	SSOP-20
MB15F05L	1800/233	3	5	SSOP-16, BCC
Mask Programmable PLLs				
MB15Sxx	300	3	3.5	SSOP-8
MB15S01	233.15/259.2	3	3.5	SSOP-8
MB15S02	284/116	3	3.5	SSOP-8
MB15S03	178/129.55	3	3.5	SSOP-8

Fujitsu's E series single PLLs cover frequency ranges up to 2500 MHz, while the F series dual PLLs range up to 2000 MHz. And, with fast lock times, low power consumption, balanced charge pumps, low phase noise and an advanced power save feature — you'll be able to meet present and future portable design requirements with ease. Plus, our S series mask programmable PLLs allow you to specify either one or two output frequencies between 50 MHz and 300 MHz.

(Images not shown at actual size.)

BCC

MB15E03

Introducing Fujitsu's new Bump Chip Carrier (BCC) package — half the footprint and volume of a standard PLL and even smaller than your average lady bug. Call today for more information.

Call us today at **1-800-866-8608 Ext. 1281, Dept. DNN** and find out how Fujitsu delivers the right PLL solution for less. And, check out our PLL cross reference list at **www.fujitsumicro.com** to see how we stack up against the competition.

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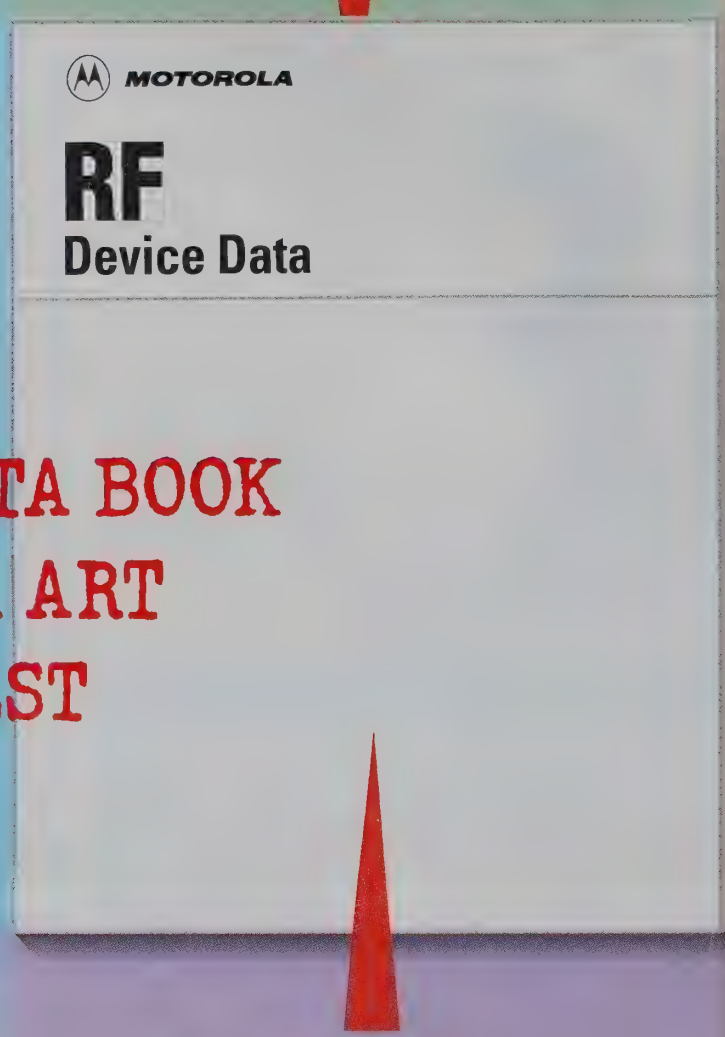
More Information - Write in 424

With all the effort we put on the inside...



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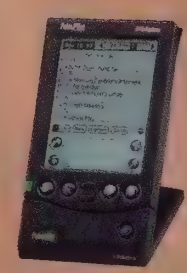
CONTEST

GREAT PRIZES:

- **Winner**
  Receives set of Motorola TalkAbout™ Plus two-way radios.



- **Drawing**
  All entries will be automatically entered in the drawing for a PalmPilot™ Pro organizer with modem.

- **All Entries**
  will receive a beautiful Motorola hardwood executive pen.

...we'd really like your help on the outside.

Motorola would like you to design the cover of our new 1998 RF/IF Data Book! Because just as your input over the years has helped us create the innovative products inside our data books, we know it'll do the same for the outside.

It's also our way of making the point that we're a new Motorola, aggressively increasing our efforts to support all our customers' needs – including those of the RF and IF markets and their customers. After all, the only reason we are successful is because of you.

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CONTEST RULES

- ***On a piece of 8.5 x 11 paper, draw your idea for the cover to our new 1998 data book.***
- ***Once you have completed the drawing, mail it to:***
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  or fax it to:
  Attn: Data Book Contest at (602) 244-5898
- Please make sure you include your name, company, and telephone number.
- Entry deadline is January 30, 1998.
- The winner will be announced at the Motorola booth during the Wireless Symposium & Exhibition on Feb.12th. At that time, we will unveil the contest winning drawing.*

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ATM Via Satellite
Advanced Communications Capabilities From Virtually Anywhere on Earth

ATM technology possesses an infrastructure that allows network capacities to grow easily and proportionately as the demand increases worldwide.

Susan Miller, COMSAT Corporation

ATM — Asynchronous Transfer Mode - is building momentum and is rapidly being recognized as the base technology for the next generation of global communications, spanning diverse applications and a variety of speeds and distances. ATM technology was designed and built for integrating applications with diverse transmission requirements, allowing multimedia information — voice, video and data services — to be carried *simultaneously* through a single integrated network; a powerful communications tool for businesses today.

ATM was originally developed for transmission via fiber-optic cable. Many regions of the world do not have fiber-optic cable infrastructure, yet businesses increasingly require the broadband/ multimedia capabilities and bandwidth efficiency of ATM wherever they operate. This has created a need for ATM via satellite.

In March 1997, COMSAT Corporation introduced the first commercial ATM via satellite service. The quality of this service is comparable to fiber and meets stringent International Telecommunication Union (ITU) standards. The new ATM via satellite service allows telecommunications companies, Internet Service Providers, multinational and other corporations to transmit a large array of information from virtually anywhere in the world with high quality of service. Many companies today are evaluating how to incorporate ATM via satellite into their global networks as a means to gain a competitive advantage.

Acceptance and Utilization of ATM Technology

The use of ATM has expanded greatly in the past few years. Using cell-oriented switching with fixed-size cells (53 bytes) and a connection-oriented protocol, ATM reliably multiplexes digital transmissions that expand and accelerate available bandwidth, making it feasible for customers to transmit multiple types of information when needed. In essence, because of ATM's flexibility, customers can use bandwidth more efficiently by accessing smaller amounts of bandwidth for voice-only transmissions or larger amounts of bandwidth when transmitting multimedia applications.

One major driving force behind the popularity and implementation of ATM has been the acceptance of the technology by telecommunications companies. For example, several major telecommunications carriers already have adopted, or are in the process of adopting, an ATM backbone network. The carriers' goal is to provide advanced multimedia communications services to business customers. Delivering a package of customized services for these businesses relies heavily on the flexibility of the services' platform. With ATM's inherent flexibility, these companies have reinforced their abilities to offer customized service packages and to transmit information as efficiently as possible.

Internet service providers, striving to meet customers' increasing demand for services, have embraced ATM for its ability to reliably transmit data, voice and images over wide distances rapidly. Building an ATM network that serves as a backbone for Frame Relay traffic, for example, results in higher capacity, higher speeds at congested traffic levels, and reduced latency. In effect, ATM overcomes the inherent limitations of cell-relay based networks.

Multinational corporations and other large companies also are turning to ATM to help meet new bandwidth requirements as they expand their operations. Institutions in the financial, medical and educational industries — and even large retailers — are using ATM to quickly and securely link remote sites to their networks. They utilize ATM not only for data transmission, but also for other real-time applications such as video-conferencing, telemedicine and distance learning. In turn, due to ATM's capacity and flexibility, these forward-looking organizations are also building for their future information needs. ATM possesses an infra-

structure that allows network capacities to grow easily and proportionately as the demand increases. The technology to date has been deployed in wide area networks (WANs) and is in the early stages of being used for local area networks (LANs).

And despite some industry views to the contrary, ATM-to-the-desktop is also making progress into large companies that want individual workstations to have high-speed access to multimedia applications. Examples of these applications include computer-aided design and computer-aided engineering (CAD/CAE) images, as well as full-motion video for training and video-conferencing.

ATM via satellite gives these organizations the ability to access all of these services worldwide regardless of where an organization's office is located.

Why Via Satellite?

As users increase their bandwidth requirements and migrate to more advanced technologies for their informational management needs, the reliability and reach of satellite communications has become a critical element of international transmission networks. As businesses expand globally, the interest in transmitting ATM applications via a satellite system has risen tremendously. To operate efficiently, multinational corporations must transmit and receive information in world areas that have little if any fiber-optic infrastructure capable of satisfying the video, voice and data needs of today's executives. ATM via satellite is a natural choice for creating large ATM networks covering vast distances.

COMSAT was the first organization to demonstrate conclusively that commercial satellites can carry high-quality ATM traffic comparable to fiber-optic cable. COMSAT's ATM satellite service uses the INTELSAT (International Telecommunications Satellite Organization) satellite system for its ATM via satellite applications. Commercial satellites such as INTELSAT can support ATM technology at transmission speeds up to 45 Mbps, fast enough to handle almost any multimedia need.

From the Drawing Board to the Satellite

COMSAT has been able to make ATM via satellite a reality by developing ATM-specific hardware which, when inserted in the network between the ATM switch and the satellite modem, significantly enhances ATM performance over the satellite link. The hardware devices, ALA-2000 ™ and ALE-2000™, perform two vital functions: data compression without information loss and adaptive Reed-Solomon error correction. By doubling the effective throughput of the ATM traffic and providing virtually error-free performance for the overall traffic stream, these features make possible advanced traffic management capabilities such as resource management notification, priority scheduling and congestion control.

The ALA-2000 is an intermediate rate device that operates at duplex rates of 8 Mbps and below, and the ALE-2000 is a high-speed device that supports duplex E3 (34 Mbps) or DS3 (45 Mbps) links and accommodates the conversion from one interface standard to the other. These devices also incorporate algorithms that enhance even the basic performance of the ATM network.

The ALA-2000 enables transport of ATM traffic over satellite links operating at fractional T-1 to 8 Mbit/s information rates. It uses powerful Forward Error Correction (FEC) and interleaving to provide fiber-like quality over satellite. The adaptive RS coding and data compression techniques employed allow extra bandwidth to be allocated to ATM applications. Also, different priorities of traffic are accommodated through intelligent traffic management buffering operations. The ALA-2000 interfaces to all standard ATM switches, and supports a variety of popular terrestrial interfaces for interconnection of standard ATM network interfaces to non-ATM standard satellite link rates. Applications include both public and private networks.

In early 1998, COMSAT will offer options for the ALA-2000 that will allow the use of Internet Protocol technology and give customers the choice of transmitting Frame Relay traffic as well.

The ALE-2000 facilitates satellite transport of ATM traffic in high-speed ATM networks and is inserted between the DS3 (or E3) modem at an earth station. ALE-2000 improves ATM cell transmission quality over satellite links through a specialized cell-based interleaving algorithm and a cell-based RS Forward Error Correction (FEC) scheme. Applications for the ALE-2000 include trunking, fiber replacement and large private networks.

Conclusion

The communications possibilities are virtually endless when it comes to ATM via satellite. The availability of the technology opens doors for many companies, especially those who need to communicate with far-off places. Sharing data and multimedia applications across borders using satellite communications technology is an important step toward meeting the informational needs of the next millennium.

ATM via satellite employs advanced satellite interface technology to transport high-quality ATM traffic in a bandwidth-efficient way. This significant technological development makes ATM via satellite a worthwhile, effective and reliable means of communication. Many organizations are taking a long, hard look at ATM and how it can enhance their competitiveness in the international marketplace. We expect ATM via satellite will continue to evolve, meeting today's and tomorrow's businesses needs to transfer high-quality information to and from remote points around the world.

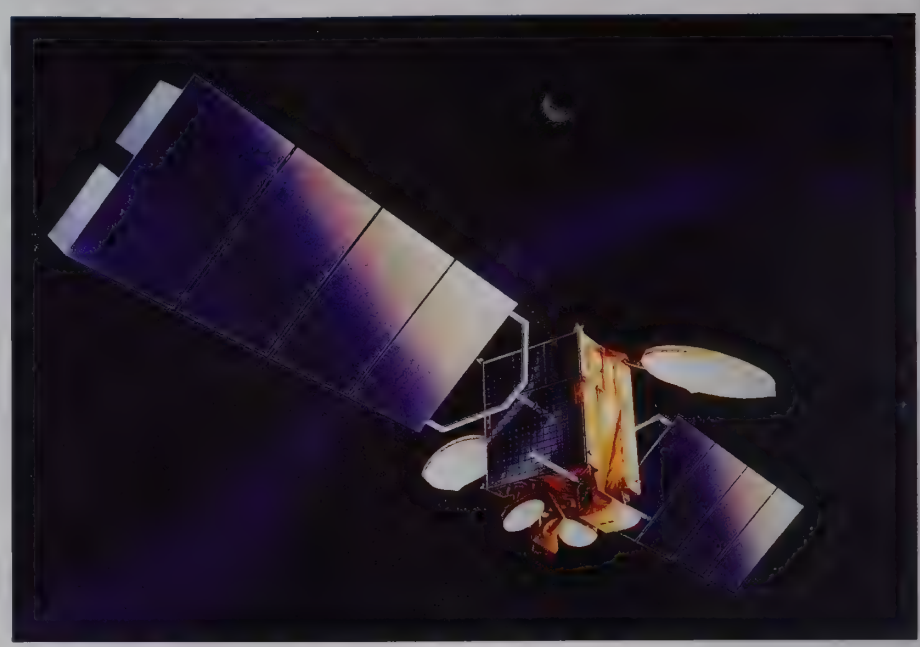

Figure 1. COMSAT's ALE-200™ makes possible ATM via satellite.

Figure 2. Satellites bring ATM technology to virtually anywhere on earth.

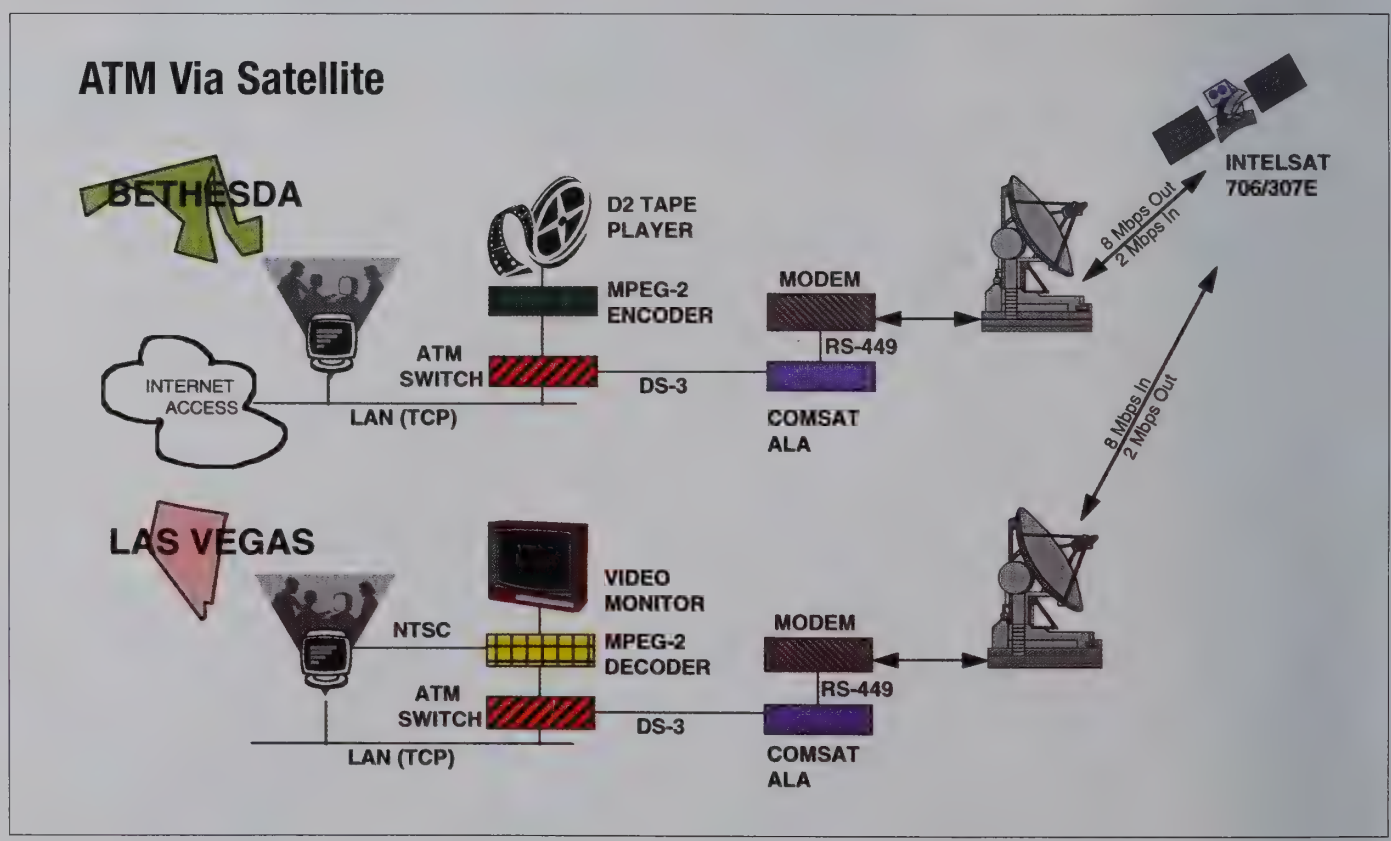

Figure 3. ATM via satellite allows voice, video, and data applications to be carried simultaneously through a single integrated network.

Susan Miller is vice president Advanced Business Applications Management for COMSAT Corporation, located in Bethesda, Md.

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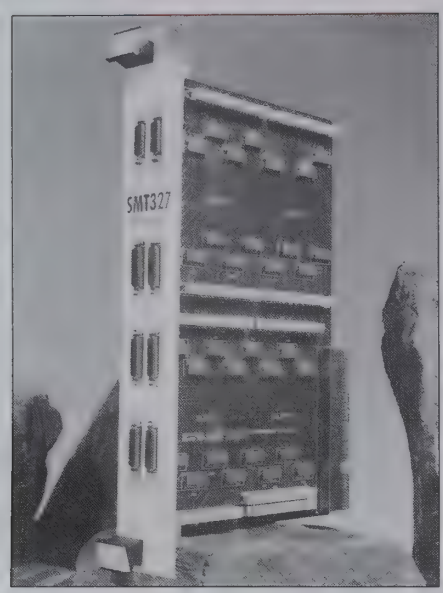

Module Carrier

A single SMT327 4-slot Texas Instrument Module carrier for the CompactPCI can host up to 8 'C4x DSPs with four of Sundance's dual processor modules. The SMT327's primary slot is connected to the host via a 20 MByte per second 'C4x communication port and via the TIM-40 global bus connector offering data transfer at up to 60 Mbytes per second. This feature is of specific benefit to I/O intensive daughter modules, such as the SMT311 Butterfly Fast Fourier Transform TIM module. The SMT327 has on-board XDS-510™ compatible interface and is compatible with GoDSP's Code Composer debugging tool. The SMT327 is ideal for embedded applications.

Sundance Multiprocessor Technology Ltd.

More Information - Write In 161

Frequency Doubler

This broad line of Frequency Doublers with in-line and 90° connector configurations are available to cover octave-plus bandwidths. The model F20KXRS provides 4 to 12 GHz output with a conversion loss of less than 10 dB (2 to 6 GHz input). These frequency doublers can be provided in drop-in packages or in hermetically sealed packages.

Device Technology

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Temperature Monitoring System

Inovonics announced the release of the company's wireless temperate monitoring system. Based on Inovonics' Frequency Agile 900 MHz technology, the system allows dealers and facility managers to measure and control temperature anywhere in a building without the inconvenience of stringing wire. The system uses battery-powered FA7216 Transmitters to accurately measure air temperature once per minute. When temperature changes exceed a fixed amount, data is transmitted to an Inovonics remote receiver, which provides an RS 232 output to the HVAC system control unit.

Inovonics Corporation

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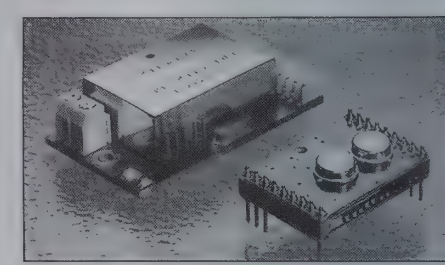

Low Power UHF Data Transceiver Module

The BiM-418-F and BiM-433-F are miniature UHF radio modules capable of half duplex data transmission at speeds up to 40 kbit/s over distances of 30 meters "in-building" and 120 meters open ground. The module integrates a low power UHF FM transmitter and matching superhet receiver together with the data recovery and Tx/Rx change over circuits to provide a low cost solution to implementing a Bi-directional short range radio data link. The high data rates (up to 40 kbit/s) and fast Tx/Rx changeover (<1 mS) make the BiM transceiver ideal for high integrity one to one links/multi-mode packet switch networks.

Radiometrix Ltd.

More Information - Write In 164

16 Mb Flash Memory

Mitsubishi Electronics announced the 16-Mbit (Mb) DINOR *MobileFLASH*™ memory, which offers access times as fast as 80 ns, and is targeted for low-power, high-density portable communication, computing and networking applications. The single-supply, 3.3V-only device is pin-compatible with Mitsubishi's existing 8-MB DINOR *MobileFLASH* memory and occupies the same board real estate, making it easy for customers to upgrade. The 16-Mb DINOR flash memory is especially useful for low-power applications requiring a fast access time and high-density code and data storage. Handset applications, can immediately benefit from the added capacity to store large, complex character sets such as those used for the Japanese and Chinese languages. The 16-Mb DINOR *MobileFLASH* memory is available as two product types: M5M29FB/T160A and M5M29FS016A.

Mitsubishi Electronics, Electronic Device Group

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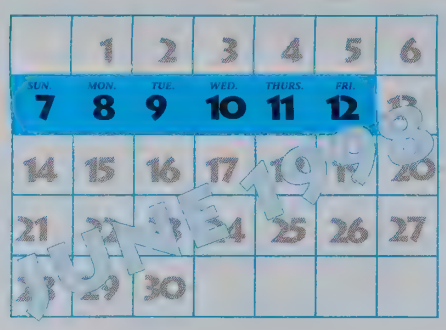

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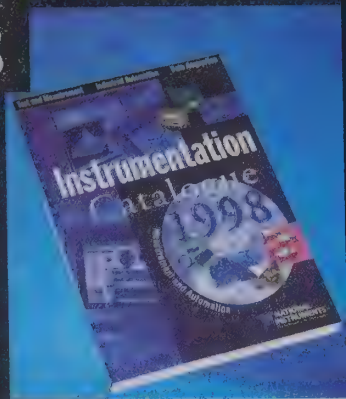

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Lucent Digital Cellular Telephone 6720

Centurion International has developed antennas for many Lucent Technologies Inc. wireless terminals which meet Bell Labs specifications.

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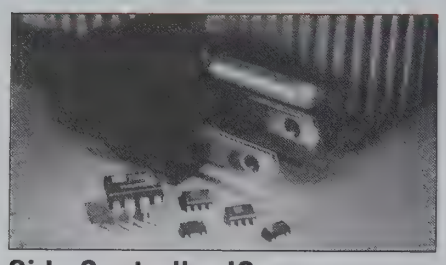

Side Controller IC

The TK75001 is a 5 pin primary side controller integrated circuit from Toko America. The TK75001 is a full featured PWM which incorporates adjustable slope compensation and a 1A drive with only 5 active pins. The low pin count and advanced internal features allow the designer to create a high performance, low cost and low component count power supply for off-line or DC/DC power conversion. This reduction in pin count is possible through the patented multi-function feedback pin which combines a PWM/current control function, a built-in compensation ramp, and a pulse-by-pulse current limiter with frequency reduction. The TK75001 is available with a standard temperature range of -20°C to +70°C and an optional extended temperature range of -40° to +85°C.

Toko America, Inc.

More Information - Write In 167

Digital Multimeter

Wavetek's digital multimeter (DMM), Model DM7 is a compact, rugged, all-trade, general purpose meter that is ideal for basic electronic and electrical troubleshooting, test and measurement. Measurement capabilities of this DMM include AC, DC, resistance and battery testing. Safety test leads and protective holsters, are standard on the DM7. The DM7, with its 2000-count precision digital readout has Tech-Preferred™ features that include AC/DC ranges to 600 volts, DC current to 200 mA, four resistance ranges to 2 MΩ, diode test and Wavetek's quick tester for 1.5 and 9 volt batteries.

Wavetek

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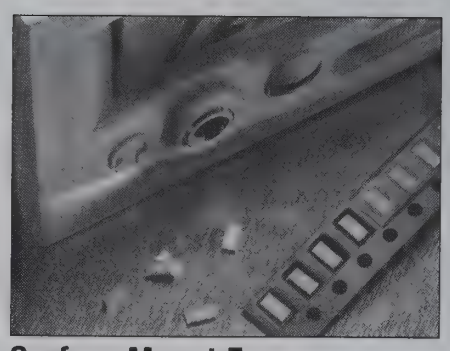

Surface Mount Fuse

Designed to meet the IEC 127-4 Universal Fuse Module (UMF) standard, Wickmann has introduced the 19445 Series of SM Chip fuses for primary circuit applications. Packaged in a 1206 chip, this fast acting fuse was developed primarily for switching power supplies, DC/DC converters, instrumentation as well as cellular phone battery chargers. Constructed of reliable thin film materials, the 19445 Series exhibits precise fusing characteristics and low internal resistance. Power drain in battery-powered devices is minimal due to lower voltage drops. Thin film technology offers stable performance in high temperature and humidity environments. The glass and ceramic casing and tin/lead coated terminations are compatible with both IR reflow and wave soldering processes. The 19445 is available in seven current ratings from 250 mA to 1.0 A with a interrupting rating of 50 Amps.

Wickmann USA, Inc.

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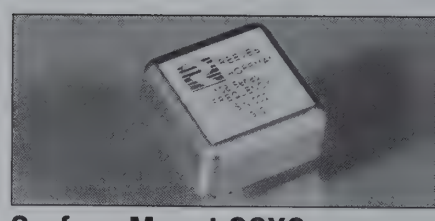

Surface Mount OCXOs

Reeves-Hoffmfan introduces the Mode 108 Series of Surface Mount OCXOs Weighing less than 15 grams and 1/2 of a cubic inch in size, the Model 108 Series of Surface Mount OCXOs covers a frequency range of 5 to 50 MHz. The Model 108 uses either a precision AT or SC crystal to achieve a wide range of performance and cost levels. Temperature stabilities can be as low as ±10 ppb over -40 to +85°C and they are able to meet the 50 ppb per year GSM requirement of the ±1 ppm for 20 years Stratum 3E requirement found in many telecom systems. AT versions of the Model 108 are perfect for Microwave and Synthesizer applications that require more economy while maintaining a high level of performance. The temperature performance for AT versions of the 108 series is as low as ±50 ppb over -30 to +70°C with aging rates as low as 200 ppb per year.

Reeves-Hoffman

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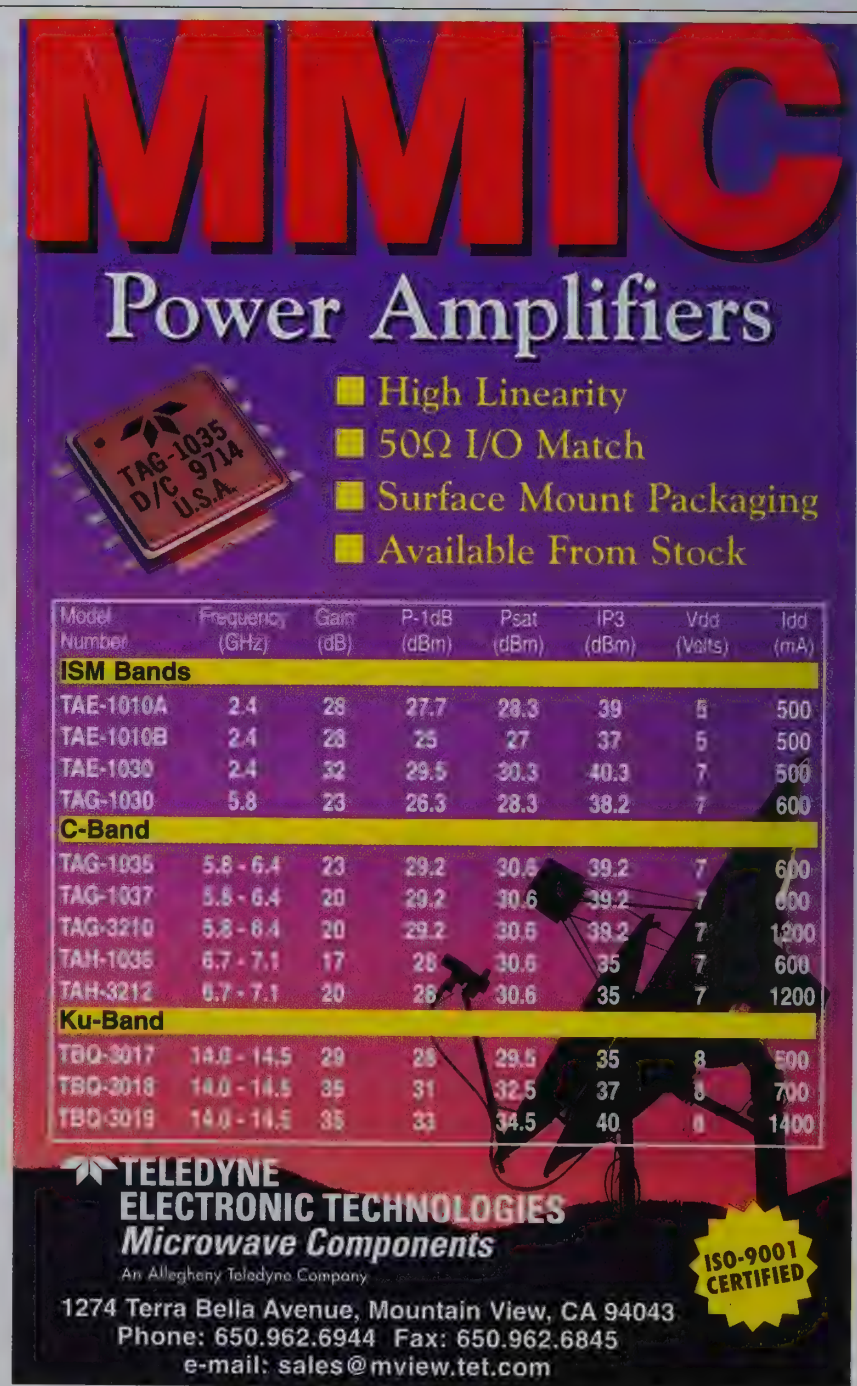

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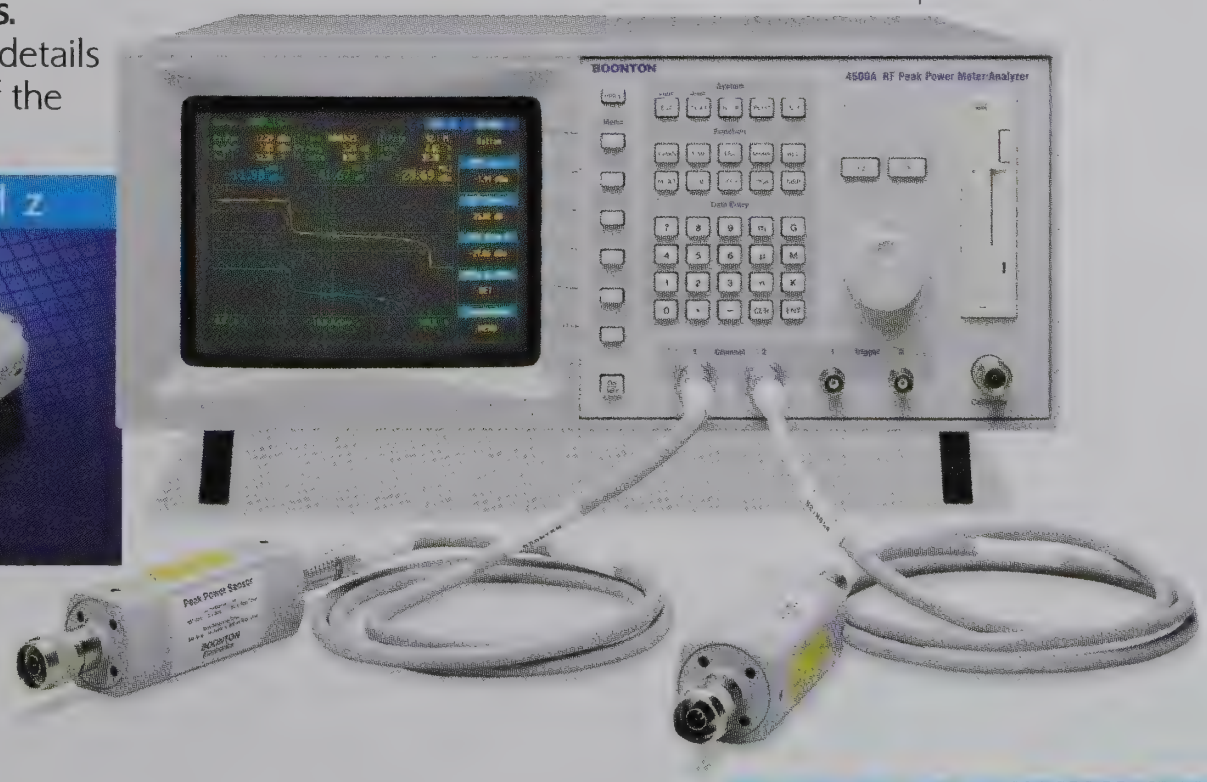

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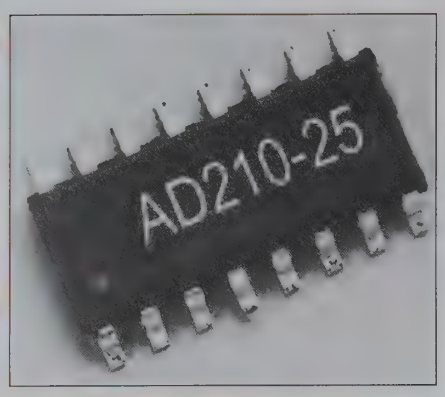

GaAs IC Digital Attenuator

Alpha Industries announces a 1 dB step attenuator ideally suited for wireless communications. This product offers excellent power control reproducibility at 1 dB steps to 15 dB and repeatability of ±.25 dB +5% of the attenuation setting. The AD 210-25 offers low insertion loss of 1.3 dB typ. at 900 MHz. The IP3 is 48 dBm while operating at 500 MHz. These attenuators are available in a SOIC-16 leaded SMT package.

Alpha Industries, 20 Sylvan Road, Woburn, MA 08101

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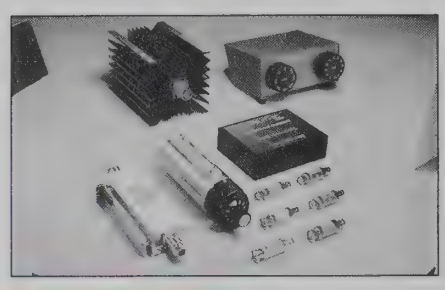
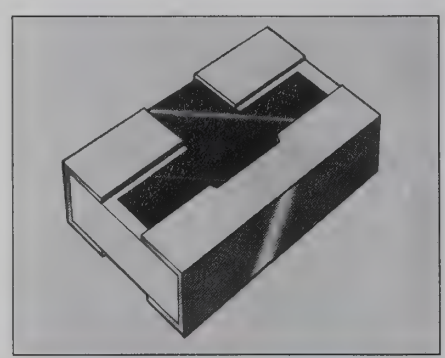


Attenuator Line

Trilithic is a leading manufacturer of RF and microwave attenuators. The component line offers a wide range of 50 and 75 ohm products including: attenuators and terminations ranging from 1 watt to 1000 watts (many operating to 18 GHz), miniature high frequency rotary attenuators, dual concentric rotaries, programmable attenuators (solid state and relay) and more. Custom designs are available upon request.

Trilithic Inc., 9202 East 33rd Street, Indianapolis, IN 46236.

More Information - Write In 174

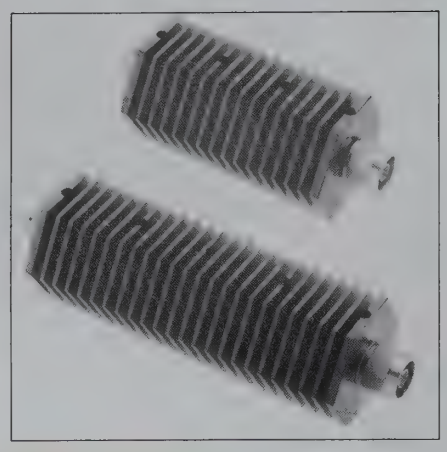


Thin Film Chip Attenuator

IMS introduces a high frequency, thin film, surface mount chip attenuator. These attenuators are 99.5% alumina substrate, in industry standard 0805 size. A wraparound NI barrier tinned 90/10 terminations, makes the attenuators ideal for reflow soldering. The attenuator has a high frequency of up to 10 GHz. Other features include low noise characteristics, low inductance and parasitic capacitance. Specifications include an operating temperature between -55°C to +125°C, maximum working voltage of 2.24 V and impedance of 50 Ω. VSWR is 1.3:1 maximum.

International Manufacturing Services, Inc., 50 Schoolhouse Lane, Portsmouth, RI 02871.

More Information - Write In 175

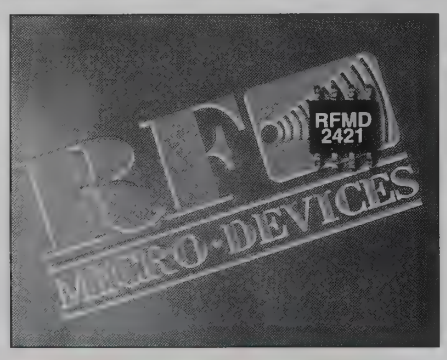


High Performance Attenuators

Conservatively rated 50 W and 75 W, 50-ohm, air-cooled attenuators include 1, 2, 3, 6, 10, 20 and 30 dB models. Dimensions, excluding connectors, are 2.3″ D × 4″ L (50W) and 2.3″ D × 6″ L (75W). Connectors include N, BNC and TNC. Maximum VSWR is 1.10:1 from DC to 1 GHz (1.25:1 from 1 to 2.4 GHz with N-type). Finishes consist of black anodized fins and silver or tri-alloy planted connectors. Non-magnetic materials used throughout.

Bird Electronic Corporation, 30303 Aurora Road, Cleveland, OH 44139.

More Information - Write In 176



10 dB Switched Attenuator

RF Micro Devices' RF2421 is a monolithic CMOS programmable switched attenuator ideally suited for communications systems that require RF power control by digital means. The RF2421, manufactured using GaAs MESFET process technology, features 1-bit digitally controlled attenuation with a single step attenuation of 10 dB and an insertion loss of only 1 dB. Operating from 500 MHz to 3000 MHz, the device's input and output has a low VSWR 50 match. Typical applications include power control for communication systems, commercial and consumer systems and portable battery-powered equipment.

RF Micro Devices, Inc., 7625 Thorndike Road, Greensboro, NC 27409.

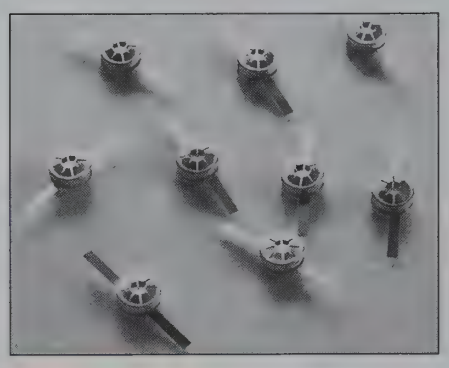
More Information - Write In 177

Voltage Variable Attenuator

The HMC173MS8 is a miniature absorptive voltage variable attenuator in an 8-lead MSOP package. The device operates with a positive supply voltage, and a positive control voltage. Unique features include a high dynamic attenuation range, and excellent power handling performance through all attenuation states. The attenuator is ideal for operation in wireless applications between 800-1600 MHz. Operation is possible from 1.7 to 2.0 GHz, with a reduced maximum attenuation of 30 dB and increased VSWR. It can be used as an external driver circuit for improved linearity of attenuation.

Hittite Microwave Corporation, 21 Cabot Road, Woburn, MA 01801.

More Information - Write In 178

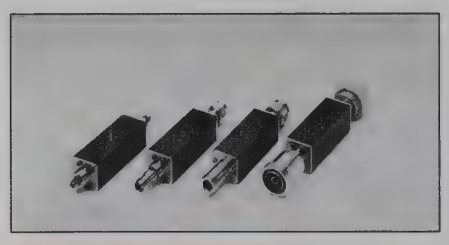


Pill Attenuators

The PSA series by KDI/triangle is a family of pill attenuators operating from DC to 12.4 GHz that is well suited for installation in stripline circuits. Offering excellent temperature stability and reliability, the PSA series is ideal for high-rel applications. Extremely durable, all the attenuators in the PSA series are laser-trimmed devices, have a proprietary thin-film resistive element, and are encapsulated in an epoxy. The attenuators have a resilient spring configuration which provides positive ground-plane contact, regardless of variations in ground-plane spacing tolerances. Attenuation accuracy is typically ±0.5 dB across the entire frequency range, and VSWR is 1.25 at 4 GHz, 1.35 at 8 GHz, and 1.50 at 12.4 GHz. The attenuators have a 50 Ω impedance and a -55°C to +150°C temperature range.

KDI/triangle Corporation, 60 South Jefferson Road, Whippany, NJ 07981.

More Information - Write In 179



Conduction Cooled Attenuators

Inmet Corporation's 2042 series of 50 watt conduction cooled attenuators feature low VSWR (1.25:1 maximum) and a variety of connector configurations including SMA, TNC, N and 7/16. The units operate in the DC-4 GHz frequency range and are available with attenuation values of 0 dB to 4 dB.

Inmet Corporation, 300 Dino Drive, Ann Arbor, MI 48103.

More Information - Write In 180

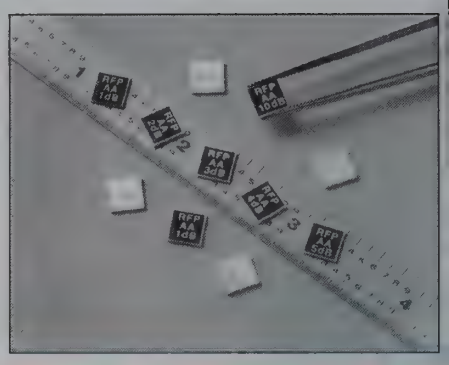
For a quick inquiry response, use the reader service card found on our web site at www.wirelessdesignmag.com/rscard.

Low Cost Attenuators

Elcom Systems announces the availability of a series of miniature 50 ohm coaxial attenuators for use from DC to 3.0 GHz. They are available with SMA, SMB, BNC and TNC connectors, in 1 dB steps from 1 to 10 dB, and 2 dB steps to 20 dB. They have 0.5 dB accuracy to 2.5 GHz, and 1 dB to 3 GHz. VSWR is 1.2:1 nominal, 1.35:1 maximum. The units have silver, gold or nickel plated connectors. Resistor networks are mounted in MIL spec plated housings.

Elcom Systems, Inc., P.O. Box 520, Closter, NJ 07624.

More Information - Write In 181

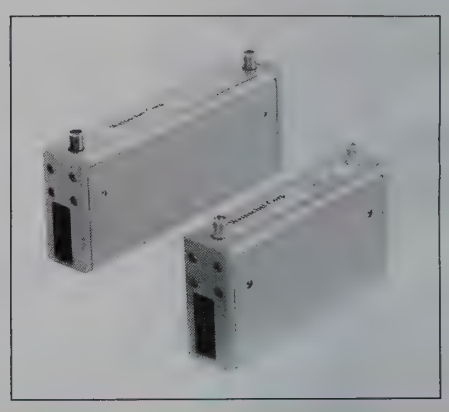


Surface Mount Attenuator Chips

The Resistive Components Division of RF Power Components has released a new series of surface mount attenuator chips in frequencies ranging from DC to 2 GHz with standard attenuation values from 1-30 dB. The series, designated as RFP250250-4AA, was designed for 50 ohm systems and features low VSWR (1.20:1 typ.), accurate attenuation and power ratings to 8 watts. The attenuators are three port devices, measuring .250″ × .250″ × .040″, with wraparound platinum silver terminals in a standard "PI" or "T" configuration where one port is connected to ground. Applications for the devices include power reduction in fixed incremental values, amplifier gain reduction, absorptive RF transistor matching and isolation ports on circulators for power monitoring.

RF Power Components Inc., Resistive Components Division 125 Wilbur Place, Bohemia, NY 11716.

More Information - Write In 182



Programmable Step Attenuators

Weinschel Corporation introduces a new generation of intelligent programmable step attenuators with a built-in TTL interface. These models are designed to simplify the control and integration of these devices into subsystem and bench applications. These intelligent attenuators programmable adjustments of RF signal levels in precise steps of 1 dB, 5 dB, 10 dB or with custom steps available. The *SmartStep*™ attenuators feature an internal microcontroller-base driver that provides a TTL-level digital interface for control of the attenuator relays. The *SmartStep* contains non-volatile configuration memory that is used to hold a wide variety of attenuator and driver-dependent parameters, including serial number, attenuator cell dB values, relay configurations, and switching requirements, which are all accessible via the I^2C interface. Nominal impedance is 50 Ω. Input supply voltage is +12.0 to +15.0 V. Three models are available: Model 150T, 151T and 152T.

Weinschel Corporation, 5305 Spectrum Drive, Frederick, MD 21703.

More Information - Write In 183

Don't just ask for

RLC SWITCHES

Insist on them for LOW INSERTION LOSS, HIGH ISOLATION and LOW VSWR to 40 GHz

RLC SWITCHES provide high quality and superior performance in a variety of designs.
Delivery responsive to your needs.

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Failsafe, Latching or Manual

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Selection of Coil Voltages including 28 Vdc and 12 Vdc

50Ω or 75Ω

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SMA, N, BNC, or TNC Connectors or Surface Mount

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RLC is your complete Microwave Component source...
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RLC ELECTRONICS, INC.
83 Radio Circle, Mount Kisco, New York 10549
Telephone: 914-241-1334 • Fax: 914-241-1753

More Information - Write in 428

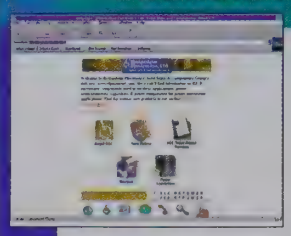
WEB Directory

www.piezo-crystal.com

Piezo Crystal Company

Piezo Crystal manufactures precision SC-cut quartz crystal resonators and ovenized crystal controlled oscilllators. An innovator in the manufacturing of precision quartz crystals and oscillators since 1936, Piezo's web site features information about the company, including technical papers.

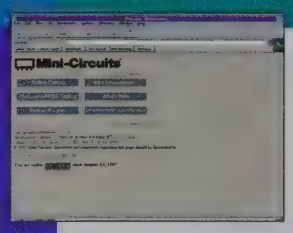
www.rell.com/rfpowernet



Richardson Electronics, Ltd.

Richardson's web site now features RELL Online, an electronic catalog including components from Siemens, M/A-COM, RF Prime, Ericsson and more. Source the products you require, submit an RFQ electronically and link to the sites of the RF and Microwave Industries leading manufacturers.

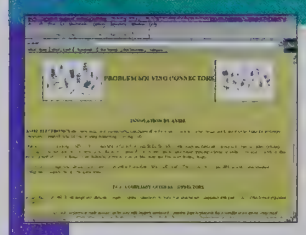
www.minicircuits.com



Mini-Circuits

Mini-Circuits designs and manufactures RF/IF and microwave components. Features of this web site include specifications and pricing information about products through an On-line Catalog, employment opportunities, monthly on-line specials, as well as a plan to lower costs year after year by joining Mini-Circuits Partner Program.

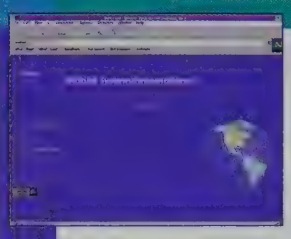
www.engineers.com/aviel/home.htm



Aviel Electronics

Aviel Electronics designs and manufactures problem solving microwave and coaxial connectors in standard and non-standard interfaces. All common body configurations can be fabricated in series ranging from sub-miniature to type L, as well as non-standard configurations needed for specialized applications.

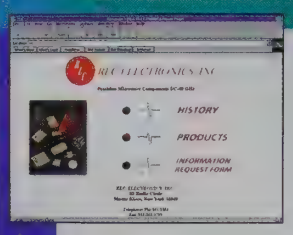
www.msi-us.com



Mobile Systems International, Inc.

MSI offers engineering/network planning tools such as: Planet®, RF Engineering Software, Maptool, GIS Data Management Software, and Databuild, Wireless Data Configuration Management Software. MSI provides initial planning, license application, deployment and optimization services to the wireless industry.

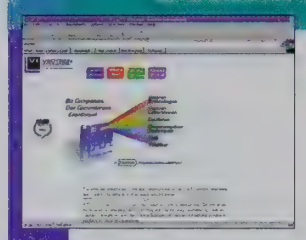
www.RLCELECTRONICS.com



RLC Electronics, Inc.

Dedicated to quality and customer service, RLC is a supplier of precision microwave components. Our extensive product line includes both standard and custom designs, and includes configurations for PCS, PCN, GPS, Cellular and INMARSAT among others.

www.vectronintl.com



Vectron International

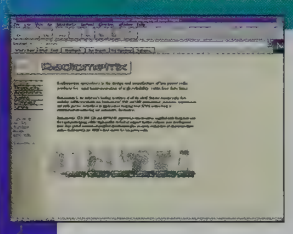
The Vectron International Group manufactures and markets frequency generation and control products using the latest techniques in both standard crystal and SAW based designs from DC to microwave frequencies. Products include: frequency sources, synthesizers, clock and data recovery modules for telecommunication and data communication applications.

www.avxcorp.com

AVX Corporation

AVX's web site is an on-line technical resource that offers engineers application software and downloadable capacitor design information. Gain access to a selection of MLC and tantalum capacitors, power supply capacitors, resistor chips, arrays and networks and integrated passive components.

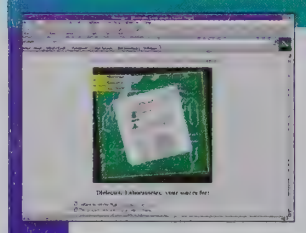
www.radiometrix.co.uk



Radiometrix

Radiometrix designs and manufactures low power radio data modules. We offer a broad range of PCB mounted transmitter, receiver and transceiver modules on VHF and UHF frequencies for OEM use. See us at the Wireless Symposium & Exhibition Show, Booth #2002.

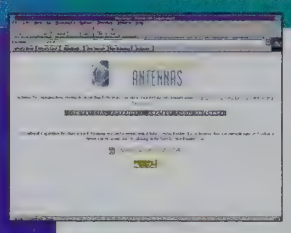
www.dilabs.com



Dielectric Laboratories, Inc.

Dielectric Laboratories has a full product catalog on-line including downloadable, easy to use, CapCad V2®, design software. Products range from single and multilayer ceramic capacitors for RF, microwave and MM wave applications to our newest product DiPak™ low cost multilayer ceramic packaging on a metal core.

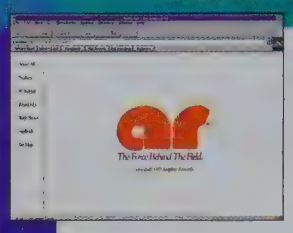
www.cushcraft.com



Cushcraft Corporation

Cushcraft designs, manufactures and markets antenna solutions in the frequency range from 30 MHz to 38 GHz. Our product line includes antennas for PCS/DCS small cell communications, WLAN, WLL, NII, LMR, trunking, cellular, ISM, MMDS, LMDS, RAD/RASP, fixed site, and other wireless applications.

www.ar-amps.com



Amplifier Research

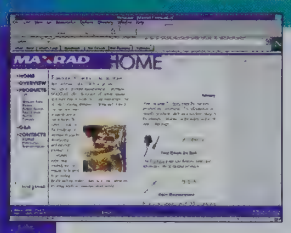
The redesign of the web site rings true with AR's new image. The design of RF interference and EMC test equipment appeals to the best scientific minds. You will find hot Java on amplifiers, antennas, interference generators, precompliance test systems, and accessories for RF testing.

www.rfmd.com

RF Micro Devices, Inc.

Link to RFMD's Investor News, Information and Samples, Technical Support, Press Releases, s-parameters and RFMD's 1997 On-line Designer's Handbook. Standard product line includes quadrature modulators/demodulators, LNA/mixers, IF amplifiers, attenuators and more. Custom designs are available.

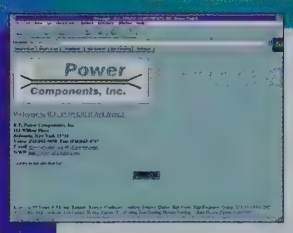
www.maxrad.com



MAXRAD, Inc.

MAXRAD is a premier supplier of antennas for the communications industry. MAXRAD manufactures a full line of mobile, portable and base station antennas ranging in frequencies from 27 MHz to 2.6 GHz.

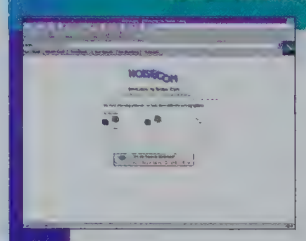
www.RF-POWER.com



RF Power Components, Inc.

RFPC maintains the highest level of customer satisfaction in its manufacture of high quality resistors, terminations, attenuators, 90° hybrids, power dividers/combiners and directional couplers for high power broadband, RF microwave and wireless applications in commercial, industrial and military markets.

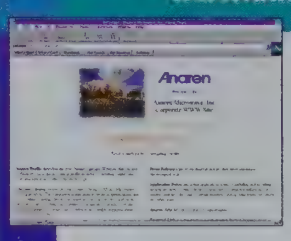
www.noisecom.com



Noise/Com

Noise Com provides an easy to navigate on-line catalog of products, and an overview of applications and services. Up-to-date information on new products, enhancements and corporate related issues can be found in "News".

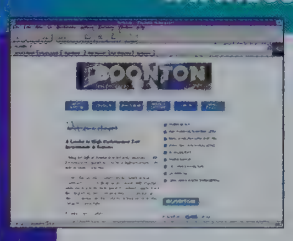
www.anaren.com



Anaren

Anaren's web site lists electrical specifications for all catalog products. A profile section describes our three business groups; Wireless, SATCOM and Defense. Features of the web site include job opportunities, press releases and the location of all Anaren Sales Reps.

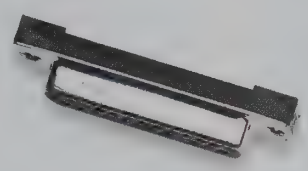
www.boonton.com



Boonton Electronics Corporation

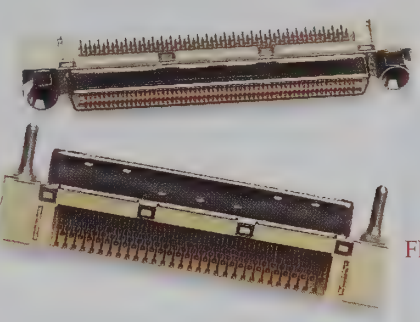
Boonton's web site provides information on test equipment dedicated to measuring the power of RF and microwave systems and how to use the equipment in commercial wireless applications. The web site includes power meters, power analyzers and impedance measuring instruments.

ACROSS A WIDE RANGE OF APPLICATIONS, MOLEX'S INNOVATIVE I/O CONNECTORS ARE MEETING TOMORROW'S STANDARDS ... TODAY. IN NOTEBOOK PCS, OUR SHORT-BODY SMT D-SUB CONNECTORS USE 30% TO 40% LESS PCB SPACE

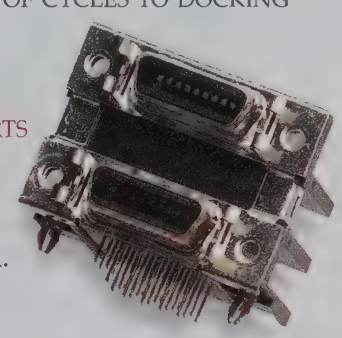


THAN STANDARD D-SUBS. MOLEX'S LOW-PROFILE

1.0MM SMT SYSTEM EFFICIENTLY CONNECTS PERIPHERALS TO PALM-TOP COMPUTERS. NOTEBOOK PCS WITH OUR 120 TO 240 CONTACT 1.0MM LEAF-STYLE DOCKING STATION CONNECTORS CAN NOW BE RELIABLY BLIND-MATED



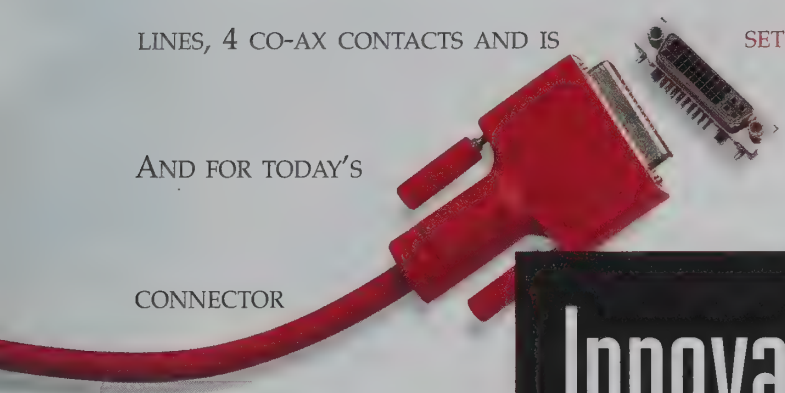
FOR THOUSANDS OF CYCLES TO DOCKING STATIONS. IN INDUSTRIAL CONTROLS, FITTING MORE PORTS



ON YOUR I/O CARD IS NOW EASIER WITH OUR DUAL-PORT .050" LEAF-STYLE CONNECTOR.

I/O Microminiature Connectors

A NEW GENERATION OF MULTIMEDIA PCS USES OUR ENHANCED VIDEO CONNECTOR (EVC) THAT HAS 30 SIGNAL LINES, 4 CO-AX CONTACTS AND IS SETTING THE STANDARD FOR DENSITY AND SIGNAL INTEGRITY.



AND FOR TODAY'S CELLULAR PHONES, OUR RELIABLE LATCHING MOBI-MATE CONNECTOR SYSTEM COMBINES 0.5MM PITCH SMT PCB TAILS WITH RF AND SIGNAL LEADS ... AND MORE! THESE ARE JUST A FEW OF THE INNOVATIVE PRODUCTS IN THE FULL LINE OF MOLEX I/O MICROMINIATURE CONNECTORS. FOR A FREE BROCHURE CALL 1-800-78MOLEX, OR VISIT OUR WEB SITE AT http://www.molex.com.

Innovations.

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Bringing People & Technology Together, Worldwide℠

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Corporate Headquarters: *2222 Wellington Ct., Lisle, IL 60532 U.S.A., Tel: 1-800-78MOLEX* • ***European Headquarters:*** *Munich, Germany, Tel: 49-89-413092-0*
Far East North Headquarters: *Kanagawa, Japan, Tel: 81-462-65-2336* • ***Far East South Headquarters:*** *Jurong Town, Singapore, Tel: 65-660-8555*

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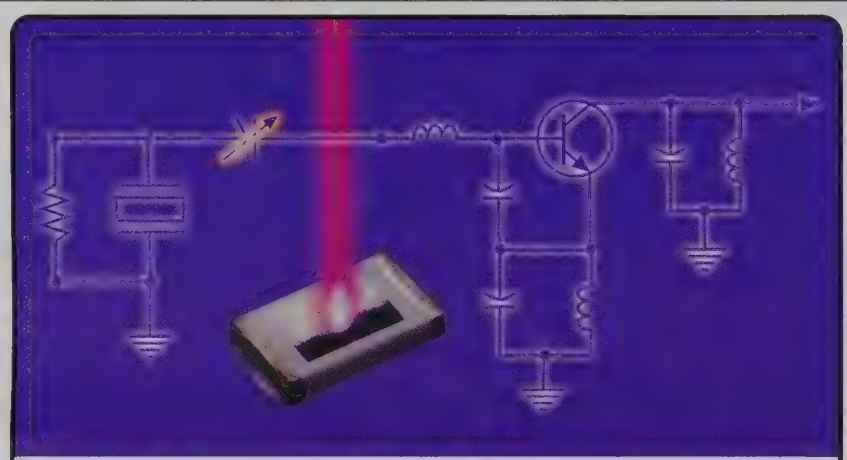
More Information - Write In 184



LASER TUNED OSCILLATORS

LASERtrim® chip capacitors can simplify your RF designs, reduce your circuit cost, and improve your product's performance. This precise, high resolution tuning method can compensate for many variances that occur in other circuit components thus increasing the accuracy of reference oscillators and improving the responsiveness of VCO's. Laser tuning is an automated process eliminating the through-put problems of manual tuning in the manufacturing cycle.

Visit us at booth #945 at the '98 Wireless Symposium for a LASERtrim® video demonstration and detailed application notes!

JOHANSON TECHNOLOGY
Camarillo, California
Tel (805) 389 1166
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ISO 9001

More Information - Write In 185

Make Your Product Wireless NOW!

Making your product wireless is no longer an expensive and challenging proposition. Simply add a tiny LINX RF module onto your board and **PRESTO!** Instant wireless transmission of serial data or control signals for distances in excess of 800 ft. No external RF components (except an antenna), are required, making design integration and FCC approvals painless, even for engineers without previous RF experience.

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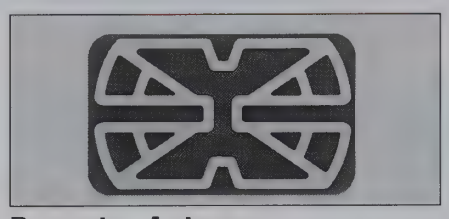
More Information - Write In 186

NEW Products

www.wirelessdesignmag.com



Repeater Antenna

The repeater antenna "Clear Chat" is designed to improve the reception sensitivity of mobile communication equipment, such as cellular phone, PCS phone and laptop computer. "Clear Chat" is structured that the antenna circuit made of silver is mounted on the front of a base member of a given size, an adhesive means is mounted on the back of the back member, and this adhesive means is freely detachable. The tacky adhesive means is made by adhering tacky urethane to the "PET" film which is base member. It is easy to peel off, and no glue remains after it is peeled off. So it is possible to stick and peel off repeatedly. If the adhesion weakens the tackiness, the tackiness can be restored by washing with water. The base member and the protective means are formed with a film or sheet. The base member is formed in the minimum size required for attachment to a portable telephone and laptop computer.

International Commercial Co., Ltd.

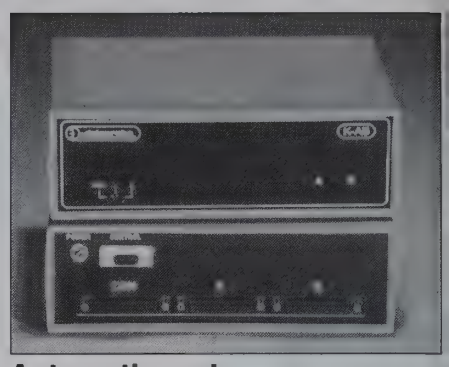
More Information - Write In 187

Digitally-Controlled Microwave Frequency Modulator

The Special Mixer Products Department of MITEQ has developed a new digitally-controlled microwave frequency modulator, Model SMC0618DDS, which accepts a 10-BIT TTL word and offsets the input carrier frequency anywhere in a ±29 kHz range. The present unit operates in the 6 to 18 GHz range and a new model for 0.5 to 2.0 GHz and 2.0-6.0 GHz range will soon be available. These units are typically used in frequency pulse-code modulation, Doppler satellite movement correction, and moving target (Doppler) simulation applications.

MITEQ

More Information - Write In 188

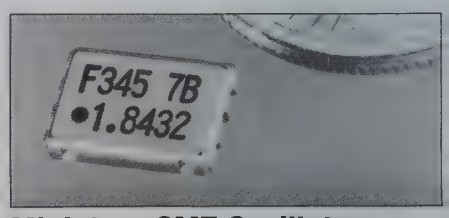


Automatic and Remote Switching

Dataprobe announces the expansion of its line of data circuit switches. Four levels of switch automation are now available to serve every possible disaster recovery application. Each level provides increasing degree of sophistication and manageability. Dataprobe provides all switches in both stand alone single-circuit switches and high density multi-circuit configurations. From simple lead activated switches for integration into remote control systems to fully-automated line protection switching, Dataprobe supports all common WAN and LAN interfaces.

Dataprobe, Inc.

More Information - Write In 189



Miniature SMT Oscillators

The F3345/3355 Series oscillators are ideal for portable computers and peripherals, instrumentation, telecommunication devices and similar applications that require a highly reliable, miniature frequency control device. The Fox oscillators measure only 0.295″ long × 0.197″ wide. Frequency range is 1.800 to 80.000 MHz for the F3345 Series, and 1.800 to 50.000 MHz for the F3355 Series. Both series exhibit frequency stability of ±100 PPM under all conditions. These oscillators are hermetically-sealed in ceramic packages and require supply voltages between +4.5 and +5.5 V.

Fox Electronics

More Information - Write In 190

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Antenna Products builds rugged antennas with UV-stabilized fiberglass radomes for years of trouble free service. The standard warranty is five years from date of installation.

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A. Please indicate the primary end product (or service) of your company at this location (check only one):

1 ❑ Consumer Electronics
2 ❑ Telecom Systems & Equipment
3 ❑ Cellular/Mobile Carriers
4 ❑ Cellular Systems & Equipment
5 ❑ Telecommunications Services
6 ❑ Communications Systems & Equipment
7 ❑ Wireless Data Transmission
8 ❑ Computers/Peripherals
9 ❑ Satellite Communications/ Telemetry (including GPS)
10 ❑ Automotive Electronics
11 ❑ Medical Equipment
12 ❑ Security Identification
13 ❑ Industrial Manufacturing/ Processing
14 ❑ CATV Broadcast Systems
15 ❑ Active Components
16 ❑ R&D Laboratories
17 ❑ Test & Measurement Equipment
18 ❑ Government/Aerospace
19 ❑ Military
20 ❑ Radar Systems
21 ❑ Lasers/Electro-Optical Systems & Equipment
22 ❑ Other (specify) 23/ _____

B. Please indicate your principal job function:

30 ❑ Design/Development Engineering
31 ❑ Design/Development Engineering Management
32 ❑ Research & Development
33 ❑ Applications Engineering
34 ❑ Production Design & Development Engineering
35 ❑ Engineering Services
36 ❑ Corporate Management
37 ❑ Purchasing and Procurement
38 ❑ Consultants
39 ❑ Other (specify) 40/ _____

C. Number of employees at this site:

50 ❑ 1-19 51 ❑ 20-49 52 ❑ 50-99 53 ❑ 100-499 54 ❑ 500-1000 55 ❑ Over 1000

D. My main level of purchasing influence is (check only one):

70 ❑ Place orders
71 ❑ Involved in final vendor selection
72 ❑ Specify acceptable brands
73 ❑ Recommend vendors or brands
74 ❑ Evaluate products/services
75 ❑ Develop product specs

E. At what stage is your organization in the design process for the products you're involved with (check only one):

80 ❑ Concept
81 ❑ Definition
82 ❑ Breadboarding
83 ❑ Prototype
84 ❑ Manufacturing Model

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For FREE product information WRITE item number in boxes below.

Write in Reader Service Number for urgent items.

Please help us with our market research.

In the next 12 months, which of the following types of antennas and support equipment do you plan to purchase (check all that apply)?

01 ❑ Antenna Mounts/Clamps
02 ❑ Antenna Pedestals
03 ❑ Antenna Rotators
04 ❑ Antenna Towers
05 ❑ Antennas, Broadcast (Receive)
06 ❑ Antennas, Broadcast (Transmit)
07 ❑ Antennas, Directional
08 ❑ Antennas, Ground Plane
09 ❑ Antennas, Helical
10 ❑ Antennas, Horn
11 ❑ Antennas, Log Periodic
12 ❑ Antennas, Millimeter-Wave
13 ❑ Antennas, Parabolic
14 ❑ Antennas, Phased-Array
15 ❑ Antennas, Satellite Ground Station
16 ❑ Antennas, TVRO

Over the next 12 months, which types of waveguide equipment do you anticipate purchasing (check all that apply)?

17 ❑ Waveguide-To-Coax Adapters
18 ❑ Waveguide Fittings
19 ❑ Waveguide Pressurization Systems
20 ❑ Waveguide Supports
21 ❑ Waveguide Switches
22 ❑ Waveguide Windows
23 ❑ Waveguides, Electroformed
24 ❑ Waveguides, Flexible
25 ❑ Waveguides, Rigid
26 ❑ Waveguides, Solid-Dielectric

How many meters of completed waveguide, for all frequency bands, do you anticipate purchasing?

27 ❑ 1 - 10 28 ❑ 11 - 25 29 ❑ 26 - 100 30 ❑ 101 - 500 31 ❑ More than 500

In the next 12 months, which of the following types of cable do you anticipate purchasing (check all that apply)?

32 ❑ Coaxial, Small Diameter (RG-58 or smaller)
33 ❑ Coaxial, Medium Diameter (RG-213/214 or similar)
34 ❑ Coaxial, Large Diameter (7/8-inch or larger)
35 ❑ Fiberoptic, Multimode
36 ❑ Fiberoptic, Singlemode
37 ❑ Semi-Rigid
38 ❑ Cable Assemblies, Flexible

How will these cables be (primarily) purchased?

39 ❑ Primarily Preterminated
40 ❑ Primarily Raw Cable, To Be Terminated In-House

In what types of applications will these antennas and transmission-line hardware be employed (check all that apply)?

41 ❑ Automotive/Transportation
42 ❑ CATV Broadcast Systems
43 ❑ Computers & Peripherals
44 ❑ Consumer Electronics
45 ❑ Datacom Systems
46 ❑ Satellite Communications
47 ❑ Industrial Control
48 ❑ Industrial Security
49 ❑ Medical
50 ❑ Military
51 ❑ Personal Communications Networks
52 ❑ Personal Communications Services
53 ❑ Production Systems
54 ❑ RF Identification Systems
55 ❑ Telecom Systems, Cellular
56 ❑ Telecom Systems, Noncellular
57 ❑ Test & Measurement Equipment
58 ❑ Wireless LANs & Data Systems

In which of the following frequency ranges will these devices be used (check all that apply)?

59 ❑ Less than 200 MHz
60 ❑ 450 MHz (ISM, POS)
61 ❑ 800 - 950 MHz (cellular radio, cellular phone, ISM, paging, CDPD)
62 ❑ 200 MHz - 1 GHz (not including above)
63 ❑ 1.5 GHz (GPS)
64 ❑ 1.8 GHz (DECT)
65 ❑ 1.9 GHz (to 2.0 GHz)
66 ❑ 2.0 GHz (PCS)
67 ❑ 2.4 GHz (ISM, WLAN)
68 ❑ 5.2 GHz (Hiperlan)
69 ❑ 5.8 GHz (ISM)
70 ❑ 1 - 8 GHz (not associated with above)
71 ❑ 8 - 18 GHz
72 ❑ 18 - 40 GHz
73 ❑ More than 40 GHz

What is the approximate size of your budget for antennas and related transmission-line hardware over the next 12 months?

74 ❑ More than $1 million
75 ❑ $500,001 - $1,000,000
76 ❑ $250,001 - $500,000
77 ❑ $100,001 - $250,000
78 ❑ $50,001 - $100,000
79 ❑ $25,001 - $50,000
80 ❑ $10,001 - $25,000
81 ❑ $5,000 - $10,000
82 ❑ Less than $5,000

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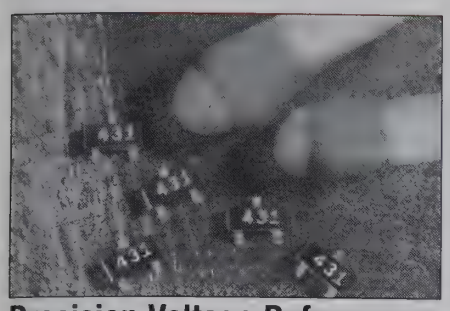
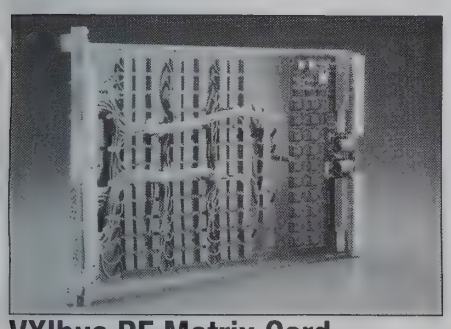


Precision Voltage References

Semtech announced a family of precision voltage references and adjustable shunt regulators. Initially consisting of four devices, the small footprint, low-cost components are optimized for use in AC-to-DC and DC-to-DC power supplies found in desktop and portable computers, home and industrial instrumentation, advanced consumer products, automotive systems and telecommunications equipment. The SC431 and SC431L are three-terminal, adjustable shunt regulators with minimum ratings of 2.495 and 1.24 volts respectively. The SC4040 and SC4041 are two-terminal, precision voltage references with fixed outputs of 2.5 and 1.225 volts respectively.

Semtech Corporation

More Information - Write In 192



VXIbus RF Matrix Card

A 400 MHz matrix VXIbus switch card with up to six 2 × 6 matrices or one 2 × 36 matrix is now available from Racal Instruments. The 1260-51 is a RF matrix switch card capable of switching up to 0.5 A and 125 volts. Its 400 MHz bandwidth makes it ideal for telecommunications, datacom and general signal switching applications. The 1260-51 may be configured as six 2 × 6 matrices, three 2 × 12 matrices or one 2 × 36 matrix. This structure makes the 1260-51 ideal as the heart of a RF switching system for VXIbus systems.

Racal Instruments, Inc.

More Information - Write In 193

Dual Band Base Station Antenna

This low-profile, compact antenna operates at both 2450 MHz and 912 MHz. This antenna is ideal for PCS/WLAN-Band applications. Specifications for Models 9707-800 include frequency of 2450 (±50) MHz Power and 912 (±10) MHz port, polarization is circular, VSWR is 1.5:1 maximum and RF connection is Type N Female.

Seavey Engineering Associates, Inc.

More Information - Write In 194

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Lower Frequencies

NEW PVF Series, Small Footprint VCOs
- 0.3" x 0.3" x 0.16"
- 200 MHz to 1000 MHz
- -93 dBc/Hz @ 10K

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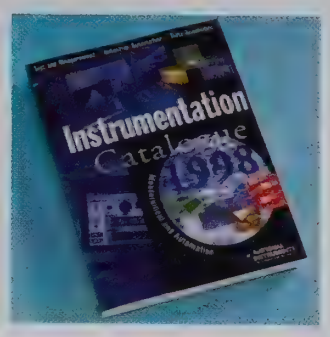
- 0.5" x 0.5" x 0.205"
- Surface Mount
- NEW 190 MHz to 2800 MHz

Subminiature Size, Series PVS
- 0.3" x 0.3" x 0.08"
- 3V operation

PES Princeton Electronic Systems, Inc.
PO Box 8627, Princeton, NJ 08543
(609) 275-6500 FAX (609) 799-7743
http://www.pesinc.com/~pesinc/ email: pes@pesinc.com

More Information - Write In 195

1998 Instrumentation Catalogue



The National Instruments 1998 Catalog features hundreds of products for computer-based measurement and automation. Some of the new products in the 1998 Catalogue include our new PCI line of PCI-based modular instrumentation products, the latest version of LabVIEW graphical programming software, and our IMAQ imaging and analysis software and hardware.

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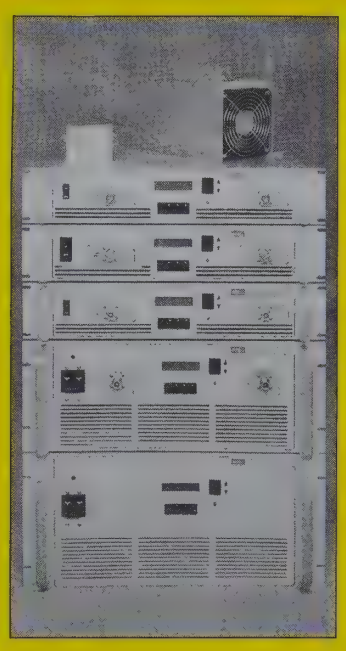

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- Satellite Audio
- Cellular
- Military Satcom
- Surveillance
- Inmarsat
- Satellite Uplinks
- Navigation

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Web Site: http://www.seaveyantenna.com

More Information - Write In 198

FILMTRIM® Single Turn Plastic Trimmer Capacitors

- Cap ranges: 1.0-3.5 pF to 25-600 pF
- Q to 5000 at 1 MHz
- Operating temp:
  PTFE, Polycarbonate, Polyimide: -40° to +85°C
  Polypropylene: -40° to + 70°C
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5 mm Types
Rugged:
- Operating temp: -55° to +125°C
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Economy:
- Operating temp: -25° to +85°C
- Cap ranges: 1.0-3.0 pF to 16.0-90.0 pF

Miniature types suitable for hybrids
- Operating temp: -25° to +85°C
- 2 series: 2.0 x 1.2 mm; 3.0 x 1.5 mm
- Cap ranges: 1.0-3.0 pF to 6.0-40.0 pF

Plastic encased 4 x 4.5 mm and 6 mm types
- Designed for volume applications
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Phone, fax or write today for Bulletin SG-305.

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More Information - Write In 199

Coherent Communications...

has won a three-year contract with **Belgacom Mobile** for its Proximus network, involving the deployment of over 1200 groups of echo cancellation. For more information contact Coherent at 703/729-6400.

Tower Semiconductor...

announced the signing of a definitive technology agreement for a license to develop and manufacture a breakthrough non-volatile memory technology, based on a proprietary flash memory concept developed by **Saifun Semiconductors,** an Israeli technology and product start-up. For more information contact Tower Semiconductor at 408/551-6500.

Centurion International's...

home page (www.centurion.com) includes files to download for portable antenna and battery pack projects for wireless communications design engineers.

Harris Corporation's...

Farinon Division announced that it has signed an exclusive contract with **BCP SA and BSE SA,** companies led by **BellSouth** and the Brazil-based **Safra Group.** The contract includes the design and installation of a microwave radio system to support the first digital cellular networks in Sao Paulo and the six-state northeastern region of Brazil. For more information contact Harris Farinon at 330 Twin Dolphin Drive, Redwood Shores, CA 94065.

CommQuest Technologies...

has been awarded a $19 million contract by **Rockwell** to design and manufacture a single chip modem for Rockwell's Universal Modem System (UMS). For more information contact CommQuest at 760/633-1618.

Kooltronic...

announces that the patent for the *Integrity Series* of Air Conditioners and Heat Exchangers was approved. The equipment , under Patent No. 5,657,641, complies with all of NEMA 4/4X requirements for use with electronic and electrical enclosures. For more information contact Kooltronic at 609/466-3400.

Love Digital Controls...

announces that their entire line of digital controls for temperature/process control are now available with CE marking for marketing throughout the European Economic Area (EEA). For more information contact Love Controls at 219/879-8868.

Intermec Corporation...

announced an agreement with **Lucent Technologies**. Lucent will install its new WaveLAN wireless network with Intermec's customized mobile computers. For more information contact Intermec at 425/348-2600.

Trimble Navigation...

announced that it has been selected as the exclusive GPS provider for **VDO,** a division of the Mannesmann Group. Trimble will integrate its Lassen™-SK8 GPS module into VDO's MobiMax™ telematics terminals. For more information contact Trimble at 408/481-8000.

CTS...

completed the acquisition of the **Dynamics Corporation of America (DCA),** which included **Reeves-Hoffman.** For more information contact CTS at 219/293-7511.

Opmaxx Inc.,...

and **LTX Corporation** announced an agreement to interface Opmaxx' leading Analog Design and Test Automation Tools with LTX's analog/mixed-signal test systems. For more information contact Opmaxx at 503/520-9200.

Nokia...

will acquire **Ipsilon Networking, Inc.,** a data communications company, for approximately $120 million, subject to regulatory approval. For more information contact Nokia at +358 9 5113 8193.

ANADIGICS, Inc.,...

has been named to **Forbes Magazine's** annual list of America's 200 Best Small Companies. For more information contact ANADIGICS, 35 Technology Way, Warren, NJ 07059.

Yuasa-Exide, Inc.,...

has combined several of its existing stationary battery service groups into a single entity. The new organization, **Yuasa Integrated Systems & Services (YIS&S)** will provide sales and service of YEI power, batteries and other ancillary products throughout the telecom, UPS and utility industries as a united group. For more information contact Yuasa-Exide at 800/538-3627.

Astron Corporation...

announced the acquisition of **Antennaco,** a leading provider of antennas for wireless communications. Astron also announced that all Antennaco products will continue to be sold under the Antennaco brand name. For more information contact Astron 703/450-5517.

Synacom...

and **Ericsson** have signed a Letter of Intent for the distribution of fraud prevention systems for D-AMPS/AMPS networks. For more information contact Synacom at 408/296-0303.

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More Information - Write In 148

OTC Telecom...

and **Harris Semiconductor** agreed to partner on the development of a wireless LAN product that will enable network communications at an 11 Mbps data rate using DSSS technology. For more information contact Harris at 407/729-4928.

Ansoft Corporation...

and **VLSI Technology, Inc.** have formed a strategic partnership for signal integrity analysis of advanced packages such as high performance Ball Grid Arrays (BGA). For more information contact Ansoft at 412/261-3200.

CITEL, Inc.,...

is pleased to announce a sale agreement of its U.S. patent No. 4,616,155 to **TII Industries.** By this agreement Citel authorizes TII to use its coaxial gas tube technology. For more information contact Citel at 305/621-0022.

Hewlett-Packard Company...

announces that it has acquired **Optimization Systems Associates Inc. (OSA)** of Ontario, Canada. OSA develops computer-aided engineering software specializing in optimization technologies. For more information contact Hewlett-Packard at 818/879-6200.

Allen Telecom Systems...

announced that BriteCell™, the high-performance fiber optic coverage system designed to enhance coverage and capacity in buildings and enclosed spaces, has received type approval from the FCC (BCR9GBPCSBC). For more information contact Allen Telecom at 216/349-8400.

InTalk Inc.,...

introduces its wireless LAN solution. The InTalk takes advantage of **Harris Semiconductor's** PRISM™ DSSS radio integrated circuit technology and meet the new IEEE802.11 WLAN industry standard. For more information contact InTalk at 800/510-1516.

Paradigm4, Inc.,...

announced that it will incorporate encryption technology from **RSA Data Security, Inc.,** a wholly owned subsidiary of **Security Dynamics Technologies, Inc.,** into its ADCO™ wireless data outsourcing solution. For more information contact Paradigm4 at 212/303-5555.

WinStar Communications, Inc.,...

announced it has signed an agreement to acquire 11 additional 38 GHz licenses, enabling it to increase coverage in Nashville, Tenn., and 10 other U.S. markets. For more information contact WinStar at 212/684-4000.

Wakefield Engineering...

and **Flomerics** have enhanced their joint marketing agreement to promote comprehensive thermal management solutions to customers. For more information contact Wakefield at 617/245-5900.

Raytheon Wireless...

announced its joining of the University of New Hampshire Interoperability Lab (UNH IOL) Wireless Consortium. For more information contact Raytheon at 508/470-9050.

Andrew Corporation...

received FCC type approval for its Andrew Communications Extender (ACE) 1312 and ACE 1316 series RF band selective repeaters. For more information contact Andrew at 708/349-3300.

Analog Devices...

announced the purchase of **MediaLight, Inc.** MediaLight will become part of Analog's Communications Divison. For more information contact Analog Devices at 617/329-1241.

Digital Voice Systems, Inc.,...

has licensed its innovative AMBE® Voice Compression Software to **NEC Australia** for use in the OPTUS Satellite System. For more information contact Digital Voice at 617/270-1030.

Metapath Software...

announced that five venture capital firms have infused the company with an additional $11.75 million. Previous investors **Norwest Venture Capital, Bessemer Venture Partners and US Venture Partners** participated with **Robertson, Stephens & Company and Technology Crossover Ventures.** For more information contact Metapath at 425/519-2037.

CBIS®...

and **Portal Software, Inc.,** announced a strategic partnership under which both companies will offer Portal's Infranet™ software to Internet providers around the world. For more information contact CBIS at 513/397-7777.

Reeves-Hoffman...

announces ISO-9001 certification by EQR, a certifying agency. The certification will last for 3 years. For more information contact Reeves-Hoffman at 717/243-5929.

M/A-COM...

and **Richardson Electronics, Ltd.** expanded an existing distribution agreement to include Japan. Previously authorized to distribute Richardson is now the sole distributor of M/A-COM's selection of semiconductors, integrated circuits, connectors and passive components in Japan. For more information contact Richardson at 630/208-2200.

More Information - Write In 149

CyberDisplay™ enables full-function information display in ultra-portable devices.

Panel Displays Full-Function Information in Ultra-Portable Devices

Kopin Corporation introduced the CyberDisplay™, an extremely small, high-performance, high resolution, full-function information display. The low cost CyberDisplay is light-weight, power efficient, rugged, solid state, and only 0.24-inch diagonal in size. It enables portable communications devices and personal information products, including cellular "web phones" and small standard pagers to display text, e-mail, graphics, and video from Internet, intranet and other data or video sources. Using Kopin's proprietary miniature acrylic lens technology in conjunction with an energy efficient LED backlight, the display presents an optical image equivalent to a notebook computer monitor.

Based on Kopin's patented and proprietary SMART SLIDE™ technology, the CyberDisplay is a 0.24-inch diagonal transmissive active matrix liquid crystal display (AMLCD) imaging device which displays information at 320 by 24 pixel resolution. At 1700 lines per inch, it is an extremely dense transmissive AMLCD. In addition to displaying standard text and graphics, the display operates at video speeds and consumes less than 20 mW of power including the backlight. This combination offers OEMs performance advantages, high-quality images, and the low power consumption that portable products require.

"This is a major breakthrough in ultra-portable flat panel display technologies," said Dr. John C. C. Fan, president and chief executive officer of Kopin. "The CyberDisplay is just like the AMLCDs used in all notebook computer screens, except it is more than 1000 times smaller and consumes 100 times less power. Together with Kopin's proprietary acrylic lens, the CyberDisplay provides crisp, bright, readable images and is ideal for wireless communication, ultra-portable electronics, and other personal information devices."

Kopin is offering a CyberDisplay Evaluation Kit which includes a display, backlight, lens, electronic control unit to drive the display, power supply, cables and complete specifications.

For more information contact Kopin at 508/828-9999 or visit their web site at http://www.kopin.com.

Number Portability Solution will Save Millions in Fees

AG Communication Systems' Triggerless Number Portability solution allows wireless and long distance telephone companies to avoid millions of dollars in fees charged by incumbent local exchange carriers (ILECs) for making number portability database queries and routing calls.

Local Number Portability (LNP) allows customers to retain their current telephone numbers when changing phone companies. The Telco Act of 1996 mandates that LECs in the 100 largest metropolitan service areas support LNP by the end of the year.

To meet the FCC's deadline for deploying number portability, ILECs are faced with making expensive upgrades to their networks. To recover some of those enormous costs, ILECs plan to charge third parties, including wireless carriers and long distance providers, a transaction fee for making the database query or "dip" necessary to route calls. The fee, conservatively estimated at between 1/3 to 1 cent per call, will apply to all calls that pass through ILEC networks whether the calls are to a ported subscriber or not.

"AG Communications Systems' INgage Triggerless Number Portability application is an elegant solution that protects these companies from millions of dollars in charges," noted Carl Glaeser, general manager, INgage Solutions for AG Communicaiton Systems.

The INgage Triggerless Number Portability application leverages the flexibility of the SS7 signaling network to perform number portability database queries using today's switching technology, allowing wireless and long distance companies to invest in their own networks rather than pay fees to ILECs. The application also allows wireless carriers to delay switch upgrade costs until full wireless number is mandated in mid-1999.

Wireless Phone Companies Register Low Brand Awareness Among Future Phone Users

In its latest report, *Cellular and PCS Consumer Trends: Mid-Year 1997*, The Strategis Group finds that two-thirds of future subscribers are unable to name a wireless phone carrier in their area. Among all nonusers between the ages of 18 and 29, the age group which demonstrates the highest interest in wireless phones, 74% did not know any carriers in their area.

"This means nearly three out of four GenXers would not know what carrier to call if they wanted to subscribe to wireless service," said Elliott Hamilton, vice president of North American Telecommunications at The Strategis Group. "These figures indicate that increasing brand awareness could be a key competitive differentiator."

Limited brand awareness of future subscribers is not limited to wireless carriers. Over 50% of future subscribers cannot name any wireless phone brands. Motorola registered the highest brand awareness among those who know a phone brand.

"User profiles will change considerably as over 61 million users are added to the subscriber base over the next five years. It's important to understand how future customers differ from current subscribers," said Kent Olson, consultant in The Strategis Group's Cellular and PCS practice area. "For example, future subscribers intend to spend less on a wireless phone and use it less for business than current subscribers."

Subscriber growth will affect more than demographic and usage profiles; it will also impact distribution channels. A higher percentage of future subscribers intend to purchase their phone in a discount retailer or an electronic/appliance store than current subscribers.

For more information contact Kent Olson, The Strategis Group, at 202/530-7500 or fax, 202/530-7550.

Collaborative Effort Makes First Commercial CDMA Phone Call Possible

The telephone call that launched the digital wireless revolution was recently commemorated as representatives from FWT, Inc., PrimeCo, Texas Utilities, QUALCOMM, Motorola and the City of Mesquite, TX gathered at PrimeCo Antenna Site No. 1 in Mesquite.

The occasion marked the second anniversary of the first commercial PCS digital telephone call using CDMA technology, which proved the technology could be used commercially and that antennas could be successfully placed on high-voltage transmission towers.

Because of interference problems, experts said it would be too costly and too difficult to install wireless telephone antennas on existing transmission towers. Forging ahead, FWT invented the PowerMount™, which is used in the installation of antenna arrays on existing electrical towers.

The construction of the site was the result of innovative collaboration between FWT, Inc., PrimeCo, Texas Utilities, QUALCOMM, Motorola, and the City of Mesquite. FWT designed and manufactured the unique PowerMount; Motorola provided the switching and broadcast equipment; QUALCOMM provided the digital wireless telephones and CDMA technology; Texas Utilities provided the transmission tower and the engineering expertise; and the City of Mesquite assisted by granting permits to use the existing TU structure for the placement of the antenna.

The system developed by FWT, Inc. allowed the building and launch of PrimeCo's PCS network in only 16 months.

For more information contact FWT at 817/457-3060, fax, 817/429-6160.

Modeling Process Provides Fast, Accurate Predictions in Circuit Behavior

New technologies and processes are becoming available to allow for screen printing and depositing 2- and 3-dimensional versions of resistors, inductors, and capacitors in spaces that are linewidths on the order of microns and are in many layers that are separated by distances as small as 100 microns or less. These technologies will allow for the creation of hidden passive component circuits, or a new generation of passive component integrated circuits, with the possibility of integrating an entire radio circuit in a single electronic package. These circuits will be smaller, require lower power, have higher reliability, and cost considerably less.

The current bottleneck for the progress of this technology is accurate, high speed modeling techniques. Associate Professor Dr. Martin Brooks and Graduate Research Assistant Ravi Poddar, both of the School of Electrical and Computer Engineering (ECE), Georgia Institute of Technology, are developing a new modeling technique based upon experimentally characterizing small fundamental blocks that make up a geometrical structure and then combining all the models of the various building blocks to obtain a prediction of the behavior of a larger structure. Brooke and Poddar construct equivalent circuits of the passive components, and by using these circuit simulations, they obtain high frequency predictions of electrical behavior.

The method has been experimentally shown to produce accurate results well past the first self-resonance frequency of the structure, generally up to the 10-20 GHz frequency range, according to Brooke and Poddar. In terms of speed, the method is orders of magnitude faster than traditional methods, such as finite element analysis or the method of moments. As an example, a spiral inductor simulated on a Sun workstation using a method of moments solver required over four hours of simulation time.

In contrast, performing the same simulation using the new modeling technique needed under two minutes—100 times faster than using the traditional methods. "In short, we believe this method could be the key to unlocking the full potential of the various new integration technologies, and allow us to proceed to new levels of system integration and miniaturization," according to Brooke.

For more information contact Martin A. Brooke, associate professor at 404/894-3304 or Ravi Poddar, graduate research assistant at 404/894-5294.

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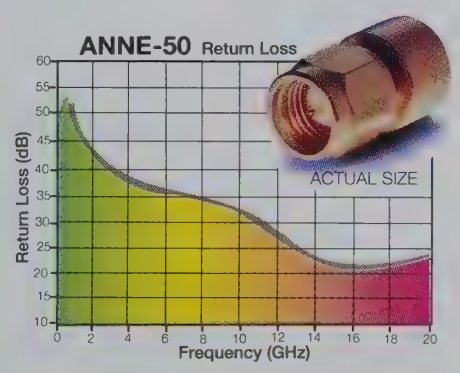

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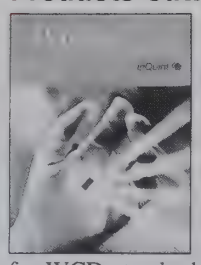
Accurate EMC Testing

Lindgren™ RF Enclosures announces the availability of new literature on its compact range of GTEM Cells for EMC Testing. The Lindgren GTEM Cells are described in the literature as a value alternative to OATS testing, or to larger anechoic chambers, when EMC test applications call for quick turnaround or numerous testing parameters. The GTEM Cells provide fast, accurate test results within a space-saving, pyramidal enclosure. The new literature includes an illustrated explanation of the GTEM concept and presents electrical and physical specifications.

Lindgren RF Enclosures, Inc.

More Information - Write In 200

Wireless Communications Products Catalog



TriQuint introduces a 240-page product catalog featuring Wireless Communications Division (WCD) product offerings and GaAs manufacturing sevices. The catalog provides complete data sheets for WCD standard IC products as well as application notes and evaluation board productivity kits to assist RF system designers in choosing integrated devices that best meet their design requirements. Foundry design and manufacturing support options, including full descriptions of design tools, prototyping, training, wafer fabrication and packaging services are also highlighted.

TriQuint Semiconductor, Inc.

More Information - Write In 201

Engineering Bulletin Features Inductors

Sprague-Goodman Electronics is offering a 10-page Engineering Bulletin featuring their complete line of SURFCOIL® Chip Inductors. Bulletin SG-800E incorporates features, specifications, and outline drawings for the 6 sizes of inductors (0402, 0603, 0805, 1008, 1210 and 1812). Twelve series are described, including the recently introduced GLZ Series. The charts list inductance, Q, self-resonant frequency, rated current and DC resistance. Carrier and reel specifications are given for each model.

Sprague-Goodman Electronics, Inc.

More Information - Write In 202

Substrate Materials Brochure

A six-page, full-color technical brochure on its new 25N substrate material is offered by Arlon. The brochure describes performance advantages offered by the new substrates, developed for high speed, high frequency, high volume commercial PWBs. It points out that 25N materials offer performance advantages of PTFE materials with cost/processing advantages of traditional thermoset materials. New 25N materials are designed for operation up to 10 GHz. Typical applications examples are also provided in the brochure. These include use in many PCN circuits for cellular telephones, down converters, low noise amplifiers, antennas, and other wireless and high speed digital devices.

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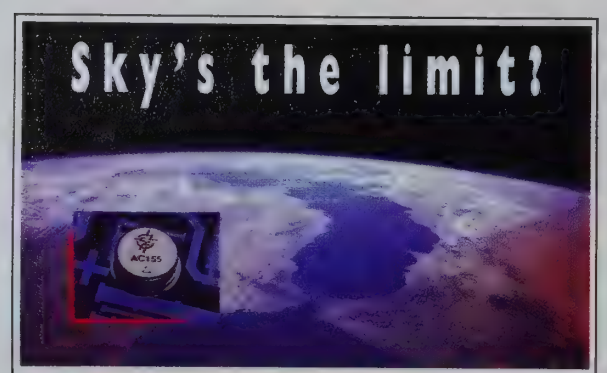

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AC3055	10-3000	10.5	2.6	17.5	5	56
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AC3057	10-3000	11.0	3.1	20.0	5	80

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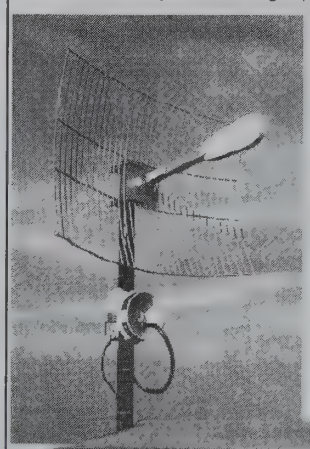

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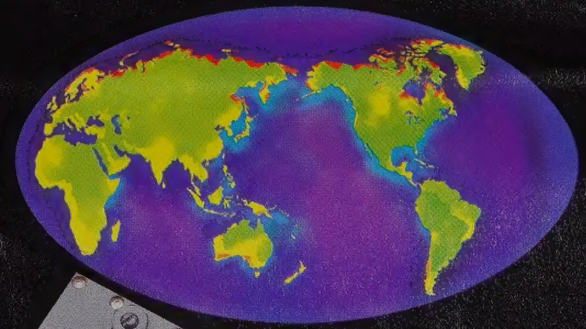

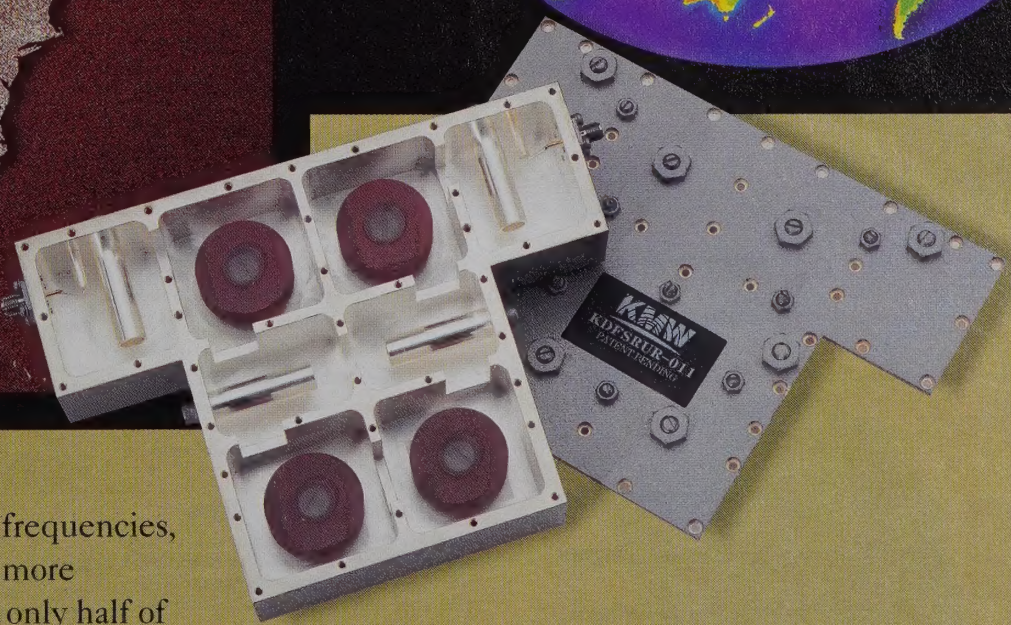

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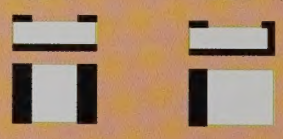
SPECIFICATIONS:

Model No. (Size)	Power-Watts W-Style	Power-Watts X-Style	Frequency GHz
RFP-050100-2	5	5	4
RFP-100200-4	30	30	3
RFP-250250-4	50	50	1
RFP-250250-6	40	40	2
RFP-250375-4	150	150	1
RFP-375375-6	300	300	0.8

SIDE VIEW

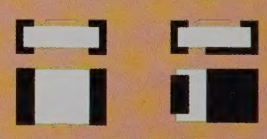
TOP VIEW



Model No. (Size)	Power-Watts Y-Style	Power-Watts Z-Style	Frequency GHz
RFP-100200-4	5	10	3
RFP-250250-4	8	16	2
RFP-250250-6	8	16	3
RFP-250375-4	10	25	2
RFP-375375-6	12	30	3

SIDE VIEW

BOTTOM VIEW



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